

BRASS WORLD

AND

PLATING — POLISHING — FINISHING

A Monthly Publication Relating to the Arts of Refining, Alloying, Casting, Rolling, Plating, Polishing and Finishing of the Non-Ferrous Metals and Their Alloys

ESTABLISHED 1905

NEW YORK, MAY, 1929

VOL. 25. No. 5

British Society Holds Conference on Chromium

Valuable Papers on Technique and Theory of Electrodeposition of Chromium Are Presented at Provincial Meeting Held in Birmingham

By OUR LONDON CORRESPONDENT

WRITTEN ESPECIALLY FOR BRASS WORLD

THE Electroplaters' and Depositors' Technical Society held its Provincial Meeting at Birmingham on March 1st, the subject before the Conference being Chromium Plating. There was a large attendance of members from all parts of the country, the largest contingent being from London. The early part of the day was devoted to a pleasurable itinerary of works, visits, etc.

The paper introducing the subject before the Conference was presented by G. E. Gardam. An abstract of his remarks and the discussion appear below.

Although a certain amount of information on chromium plating was previously available, development of the commercial deposition of chromium on the present scale was principally due to the work of Sargent published in 1920.

The two chemicals forming the essential basis of a chromium depositing solution were shown by him to be chromic acid (CrO_3) and chromic sulphate. Subsequent investigations have, however, demonstrated that whereas the addition of some second substance to the chromic acid is imperative, it is not necessary to employ chromic sulphate, and that sulphuric acid or certain other acids or their salts will give satisfactory results; owing to the fact that sulphuric acid may be readily obtained in a state of high purity coupled with the fact that sulphates are a common impurity in chromic acid, it is commonly found convenient to use this acid as the second essential chemical in chromium plating solutions.

The concentration of sulphuric acid in the solution is a matter of considerable importance, and it must bear a fixed relationship to the chromic acid content. This, for average working conditions one part by weight of sulphuric acid should be added for every hundred parts of chromic acid present in the solution. If the proportion of sulphuric acid is lower or higher than this there will be a tendency for the cathode efficiency to be reduced, so much so that in the absence of sulphuric acid from the

solution, or in the presence of a considerably greater proportion than that stated above, little or no deposit will be obtained. A further detrimental effect caused by too low a concentration of sulphuric acid is the production of deposits covered with a brownish film.

It has been found possible to produce deposits of chromium from solutions containing as little as 100 gms. of chromic acid and as much as 600 gms. of chromic acid per litre, but for general purposes most workers prefer a bath of moderate concentration, of which the following composition is typical:

	Gms. per litre	Ozs. per Imperial gallon
Chromic Acid (CrO_3).....	250	40
Sulphuric Acid	2.5	0.4

No other added substances are essential for satisfactory working, but it is evident from the change of color of the solution which takes place and also from chemical analysis that certain chemical changes occur during electrolysis. The most important of these is the reduction of a portion of the hexavalent chromium to the trivalent state. Some workers have, therefore, favored the deliberate initial reduction of part of the hexavalent chromium to the trivalent state by chemical or electro-chemical means or the addition of compounds of trivalent chromium, such as the hydroxide or carbonate. The presence of trivalent chromium in a chromium plating solution is probably essential if good results are to be obtained and baths which are working satisfactorily are usually found to contain up to 2 per cent of this substance. It is, however, important for a number of reasons that the concentration of trivalent chromium in the solution should be limited. It has been shown, for example, by Haring and Barrows and Schneidewind and his co-workers that the presence of considerable quantities of trivalent chromium greatly reduces the range of current densities in which satisfactory deposits can be obtained.

In spite of the fact that excellent results may be obtained from a solution made up from chromic acid and sulphuric acid alone, a large number of other substances have been patented as offering advantage when added to chromium depositing solutions. Such additions fall into the classes (a) additions of substances such as chlorides, fluorides, borates, phosphates in place of, or auxiliary to, the usual sulphate additions and (b) additions of salts, usually hydroxides or carbonates, of metals such as nickel, zinc, copper, the heavy and alkaline earth metals as well as chromium. In a critical examination of patents on chromium plating Schneidewind has drawn the conclusion that no fundamental improvement is obtained by additions such as those referred to above.

Operating Conditions

The most striking features in which chromium plating differs from most other metal deposition processes are the high current density necessary, the low current efficiency obtained, and the pronounced differences in the character of the deposit that result from variations of the current density, temperature and composition of the solution. In general, with increasing current density, or decreasing temperature, the efficiency increases, and the appearance of the deposit changes from a bluish colored deposit having a bright matte surface to one with a bright lustrous appearance, and finally to a dark-colored iridescent deposit often described as "burnt." The bluish deposit with a bright matte surface is usually extremely thin, and of no commercial value. The bright lustrous deposit is extremely hard and decorative, and needs little or no subsequent polishing. The dark matte deposit is obtained at much higher efficiency than the bright lustrous coating, and, though still extremely hard, can be polished by the usual methods. The resulting plate is somewhat darker than the coating deposited in the bright condition.

The balance of current density and temperature necessary, in a given solution, to obtain the bright lustrous deposit, is very sharply defined, and, moreover, varies with the nature of the cathode metal. A considerable amount of data has been empirically accumulated on the optimum average current density range in which a bright deposit may be produced. It is desirable that this range should be as wide as possible for at least two reasons: firstly, because it is often difficult to estimate the area of objects to be plated, and in such cases the current density cannot be calculated with any exactitude; and, secondly, because in the case of the large majority of articles that are chromium plated, the current density cannot be calculated with any exactitude; and, thirdly, because in the case of the large majority of articles that are chromium plated the current density varies from one part of the surface to another, being relatively high on projecting parts and low on recessed portions. The desired end is best achieved if:

- (1) A solution of chromic and sulphuric acid in the ratio, and approximately in the concentration already suggested, is used.
- (2) The bath is kept as free as possible of trivalent chromium.
- (3) The current density is moderately high (i.e., 100-300 amps/sq. ft.).
- (4) The surface of the cathode is formed of a metal of high hydrogen over-voltage (such as copper).

Influence of the Cathode Metal

It has been shown that the nature of the cathode material, and, in particular, its hydrogen over-voltage, is an important factor in determining not only the character

of the initial deposit of chromium, but also the ease with which the cathode may be covered with the deposit. In the case of metals of low hydrogen over-voltage, such as iron and steel, the minimum current density at which chromium can be deposited is higher than, and the range of current densities in which bright deposits may be produced is both different from and more restricted than, in the case of metals of high hydrogen over-voltage, such as copper. Once the cathode is completely covered with a coating of chromium, this, by virtue of its own hydrogen over-voltage, demands its own particular range of current densities for the continuance of a bright deposit. The over-voltage of chromium being fairly high, this current density range will only be the same as the "striking" range if the over-voltage of the basis metal is fairly high. It is often desirable, therefore, to coat a metal of low hydrogen over-voltage such as steel with a metal of higher hydrogen over-voltage, such as copper, before proceeding to deposit chromium upon it. As nickel has a lower hydrogen over-voltage than copper, it is thus not so satisfactory in this respect, but as an undercoat nickel has much to recommend it from the corrosion standpoint, and it is now common practice to deposit a layer of this metal on steel articles prior to chromium plating.

Anodes

Lead anodes are found to be very satisfactory, though they are slowly attacked by chromic acid solutions with the formation of insoluble lead chromate, which, however, has no detrimental action on the bath. Lead of high purity is necessary, impurities, particularly antimony, greatly increasing the rate of attack. If sufficiently large, lead anodes tend to cause reoxidation of trivalent chromium by virtue of their high oxygen over-voltage, and for this reason it is recommended that the area of lead anodes should be at least twice that of the cathode. One disadvantage of lead anodes, however, is that in course of time an adherent coating of high resistance tends to form upon them, causing, if complete, a high bath voltage. If the coating is not complete but occurs in patches its presence is not so easily detectable, and it may cause uneven current distribution and patchy deposits. A method of removing this non-conducting coating of lead chromate, involving less labour than scouring, consists in submitting the anodes to the action of a saturated solution of sodium chloride acidulated with hydrochloric acid which readily dissolves it.

Properties and Applications of Electrodeposited Chromium

Electrodeposited chromium is especially distinguished from other metals by (I) its resistance to atmospheric and other corrosion, (II) its resistance to oxidation and corrosion at elevated temperature, (III) its extreme hardness and low coefficient of friction. As deposited in the bright condition, chromium has a bright, lustrous metallic surface with a slightly blue colour. The reflectivity is only 65 per cent but, in contrast with other metals, this figure is permanently maintained as the chromium is apparently quite un-attacked by the atmosphere even at temperatures as high as 300° C., and also by salt water, salt spray, ammonia, nitric acid and hydrogen sulphide. Dilute sulphuric acid and hydrochloric acid vigorously attack the metal only if it is first rendered "active" by cathodic polarisation, e. g., by contact with a piece of zinc also immersed in the acid.

The commercial applications of chromium plating are, of course, too numerous for each to be mentioned. Among the more important applications of the thinner types of deposits, however, are the plating of plumbing fixtures, cheap jewelry and motor car fittings. The latter

in some cases have not apparently given such good service as was hoped, probably owing to the fact that the chromium was deposited directly on to brass. Nevertheless the standardization of chromium plating on certain makes of car forecast considerable popularity in the future. Some firms have installed completely automatic chromium plating plants.

Advantage has been taken of the high resistance to wear possessed by chromium deposits in applications such as the facing of gramophone record matrices, steel plug gauges, printing plates⁵, and it has been found that such parts are serviceable for from four to ten times as long when they are faced with a thin deposit of chromium. Chromium plated valves for steam and internal combustion engines have been found to withstand the action of hot gases better than similar unplated parts. Reflectors have been successfully plated with chromium, the untarnishable and un-scratchable nature of the surface compensating to a large extent for the low reflecting power.

The low coefficient of friction which chromium possesses, makes it a suitable metal with which to coat bearings, machine parts and cams. Rolls for paper finishing and glass sheet manufacture have been found to have a longer life when chromium plated; plating has also been successfully applied in the case of molds used for the manufacture of glass bottles, synthetic resin and vulcanized rubber articles as it provides a surface to which the material shows no tendency to adhere. Chromium plated die casting and ingot molds also withstand the solvent action of the molten metal to a considerable extent. Certain parts of chemical plant used in paper making and petroleum refining plants have been plated with chromium and the treatment has proved very successful.

Discussion

Following is an abridged version of the discussion which took place subsequently.

Opening a discussion, the President (S. Field) said there was still a considerable amount of doubt regarding the nature of the trivalent chromium present in the solution, and the extent to which it was combined with the chromic acid. The latter was also combined with iron which entered the solution. In one case of a poorly working solution, it was found that the trivalent chromium and iron content accounted for the whole of the chromic acid in the solution!

E. A. Ollard said failure in the early days was due to non-attention to details, e.g., solutions with as much as 20% sulphate were used. Solutions containing fluorides were easier to control. Adding sulphate to allow for "drag" was not to be recommended since it might be difficult to get rid of later. The amount of sulphate present should depend on the dichromate content. Satisfactory results were not obtained by analysing for hexavalent and trivalent chromium. The solution could be readily controlled by periodic determination of the specific gravity and the conductivity.

L. Wright said the deposit usually aimed at was the bright one, but he had obtained the matte deposit on both laboratory and commercial scale, and these could be highly polished subsequently. These deposits were obtained from a bath having a chromic dichromate content which was deemed to be unworkable by the Americans Haring and Barrows. The working range of a bath was determined by the ratio of chromium to hydrogen, not chromic acid to sulphuric acid.

A. E. Boulter asked if chromium could be deposited in a more or less ductile form to withstand vibration, as required when deposited for example on gramophone needles.

Also, would the deposit retain a cutting edge or fine point indefinitely?

J. W. Perring asked for an approximate estimate of the overall efficiency of a chromic acid plant in B.O.T. units per gram of metal deposited, taking into account the electrode efficiency, motor, generator efficiency and power required for the fan.

L. G. Roberts said he had found it possible to obtain very satisfactory results without having to remove the anodes periodically. He used a large anode surface, about half the side of the vat in area. He urged the younger platers desirous of making a success of chromium plating to spend a part of their time in studying the theoretical aspects of the problem.

S. Wernick said that the big problem of throwing power had been largely overcome in the last two years, but still chromium plating practice was very much ahead of theory. There was uncertainty in regard to the effect of constituents other than those which were essential, thus, iron was said to be beneficial in producing a brighter deposit but was detrimental since it decreased the conductivity and throwing power. Since ferrous containers were used to a large extent, it was important to know what limit was allowable. For theoretical reasons, nickel was better than copper as an underlay, resulting in a higher throwing power.

E. J. Dobbs said his experience was that determination of chromate content was a difficult matter—he could get within one gram per liter, but sulphate content could be obtained within 0.01 gram per liter. In analyzing, he added alcohol to the chromic acid solution until no further action occurred, then sufficient hydrochloric acid for all the chromium present, leaving a slight excess. The solution was then boiled to remove aldehydes present, and precipitated with barium chloride allowing to simmer for some hours before filtering. This avoided carrying down any green chromic acid with the precipitate.

D. J. Macnaughtan in an eloquent address urged that there should be the closest co-operation possible between the practical plater and the plating chemist, this being one of the foremost aims of the Society. He was supported by R. A. F. Hammond, who said that platers could best co-operate by using their powers of observation and communicating their findings to the scientific investigators, since even the most apparently irrelevant phenomena provided clues which were of the utmost value to the chemist in solving difficulties.

The author then replied to the Discussion, and was accorded a hearty vote of thanks for his paper. Votes of thanks were also moved to Dr. Sumpner, principal of the Birmingham Central Technical College for placing the Lecture Theatre at the disposal of the Society. Mr. Roberts, in seconding, suggested that the next Provincial Conference of the Society be held in Glasgow.

Half of World's Antimony Used Here

American industries consume nearly half the world's output of antimony each year, according to the United States Department of Commerce. American production is almost negligible and the metal is imported. As it is easily substituted, however, there should be no fear as to the supply, the report says. Antimony is used extensively in alloys, especially with lead and tin.

New Type Furnace Changes Brass Melting Practice

A radically new type of brass melting furnace has been developed through co-operative research by the American Gas Association and the American Gas Furnace Company, Elizabeth N. J., which embodies greatly improved efficiencies such as decreased fuel requirements, lower maintenance and labor costs, reduced metal loss, and higher quality and larger casting production, according to an article by Alexander Forward, managing director of the American Gas Association, who writes as follows in a recent issue of *The Metal Industry*:

The new furnace bids fair to revolutionize the brass foundry industry. For the first time in the history of the brass foundry industry the short lived crucible and refractory lined furnaces have been supplanted with a retort of special alloy metal.

The development of a metal alloy that would withstand working temperatures in excess of 2,000 deg. F., repeatedly, in contact with molten metal, was a part of the research program, and while crucibles have a life of only 15 or 20 heats, a single retort made from the alloy finally produced has already served for more than 250 heats and is none the worse for wear. The research in connection with the development of this equipment was done under contract between the association and the company mentioned above.

mounted that it revolves with a motor and variable chain and gear drive.

Air under pressure for combustion is supplied to the gas lines serving the burners and the gas-air mixture can be so regulated as to provide any desired atmosphere—oxidizing, reducing or neutral, within the combustion chamber, which is the space between the shell and the retort. In this case a slightly reducing atmosphere is maintained so as to prevent oxidation of the retort.

A thermocouple projects into the combustion chamber and is connected with a temperature control and recording pyrometer and in this manner the temperature of the furnace is maintained automatically and regardless of the operations of pouring and recharging. The frame containing the furnace is fabricated from structural steel members and a chain hoist is used for tilting but in the later designs this is obsolete and a much neater setup is provided.

The first of these to be used in commercial practice was installed at the plant of the Trenton Brass & Machine Company, Trenton, N. J., a firm manufacturing plumbers' supplies and selling direct to jobbing plumbers and makers of sanitary ware. The various articles here are cast from commercial bronze and yellow brass compounded in the melting furnaces and poured direct.

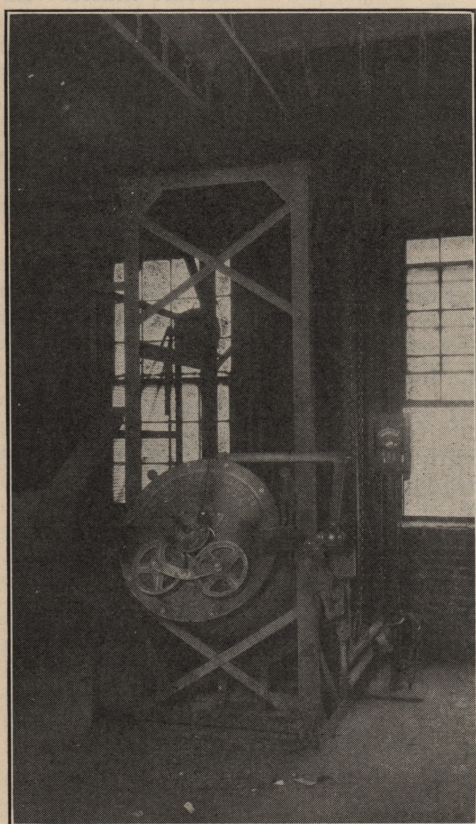
The practice is as follows: the flasks are made up on air molding machines, 16 in number, arranged along one side wall, and the pouring floor occupies that part of the room immediately adjacent. At the other end of this pouring floor and line of molding machines is a circular pouring unit consisting of two small and parallel steel rails, about six inches apart and a foot above the floor, forming a circular enclosed track, approximately 32 feet in diameter. Within the circle are four mechanical molding machines and after the flasks are made up on these they are transferred to the tracks where they remain stationary during the pouring and cooling.

The principal feature of this pouring unit is an exhaustor for the zinc oxide fumes, consisting of a post in the center which carries an overhead pipe to a point directly over the track and to which is fitted a hood. In addition there is a chain hoist with a pouring shank which holds the crucible at any desired height or position above the flasks, and while pouring the fumes are kept within the hood and exhausted through an extension of the pipe through the roof.

This exhaustor rotates with the center post so as to cover the entire circumference of the circular track. From 500 to 600 flasks can be made up and poured on this unit daily. Both this unit and the conventional pouring section are served with an overhead monorail system direct from the melting furnaces. With this system of handling a pouring schedule very closely synchronizing with the heats is possible.

The core room is at the further end of the main room and is equipped with gas-fired ovens in which the cores are baked.

Probably the greatest service rendered by this new gas furnace, aside from the elimination of crucible and refractory maintenance and remarkably low fuel consumption, is the exclusion of metal losses through volatilization and oxidation while the charge is being melted. With the best practice that can be obtained with the crucible, the volatilization losses run between five and six per cent and each crucible, as it is pulled from the furnace has to go on the skimming table and be skimmed of the oxidized metal before it can be taken to the pouring floor. Almost all of the composition used in the castings here is a yellow



The Rotary Gas Retort Brass Melter Which Was Developed Through Research Sponsored by the American Gas Association

This new brass melter consists of a revolving metallic retort externally fired and enclosed in a shell heavily insulated and refractory lined for heat concentration, atmospheric control and fuel conservation. The insulated sheet steel drum or shell is mounted on two bearings held by a steel frame so that it can be tilted at any desired angle. Ten gas burners, five on each side, are mounted on this drum in such a manner that they fire into its interior. Within the drum is the special alloy metal retort so

brass containing 72 per cent copper, $1\frac{1}{2}$ per cent tin, $1\frac{1}{2}$ per cent lead and the remainder, approximately 25 per cent zinc. To eliminate the zinc losses the retort of the furnace is fitted with an airtight cover.

Of course when new charge is put in certain gases are given off of which the retort must be relieved, and this is accomplished through a short pipe which is a part of the cover. As soon as these gases start to form, they are lighted and allowed to burn at the end of this pipe. In a few minutes they are exhausted, the flame extinguished and the operator thereby knows that it is time to screw the airtight cap onto the end of the pipe, thus sealing the entire retort charge from the outside atmosphere. Zinc losses occur only during pouring.

The astoundingly low fuel consumption of $2\frac{1}{2}$ to 4 cu. ft. of gas per pound of brass melted is one of the principal achievements of this furnace. Other economies effected include a considerable labor saving and faster heat transfer which reduces the melting time and assist in lowering the fuel requirements. There is still another appreciable fuel saving from the fact that 800 degrees of heat remain in the retort in the morning (except Monday). Inasmuch as this gas furnace is smokeless, fumeless, noiseless and gives off only a small amount of heat, the working conditions of



Pouring Brass That Has Been Melted in the New Gas Retort Furnace.
The Unique Circular Pouring Unit Is Shown

the foundry are much improved, which adds materially to the efficiency and industry of the operators.

Silver Solder for Brazing

To the Editor of BRASS WORLD:

The article in your January issue describing a huge copper tank with silver solder brazed joints was very interesting. Such methods of construction must be very expensive using silver solder, however. If the manufacturer had used the phosphor copper brazing alloy made and used by the Westinghouse Electric and Manufacturing Company, the brazing material cost would have been reduced by approximately 80 per cent.

East Pittsburgh, Pa. WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
April 3, 1929. C. J. Snyder, Engineering Department.

To the Editor of BRASS WORLD:

We have your letter stating that the question has arisen as to why the huge copper tank mentioned in a recent article in your journal and manufactured by us was brazed with silver solder rather than with a phosphor copper brazing alloy. We can state that we have tried a large variety of brazing materials, including phosphor bronze and phosphor copper alloys and that within a period of four or five months after being put in use, the butyl acetate which these tanks must withstand would attack the seams and cause leaks in the tanks. We can state further that we have been using silver solder for brazing these joints for the past two years and have had the very best results.

Cincinnati, O. ANSONIA COPPER AND IRON WORKS, INC.,
April 24, 1929. Jacob Buchert, Vice-President.

Burnishing Materials

The Abbott Ball Company, Hartford, Conn., manufacturers of various types of ball burnishing materials and equipment, has recently issued a small kit of burnishing materials containing samples of its products which are used in certain metal finishing processes. The kits have been distributed to plants using burnishing materials, for their inspection. Persons and firms interested in obtaining a sample kit, the company states, can get them gratis by addressing The Abbott Ball Company, Hartford, Conn.

Zinc Alloy Sheets for Roofing

A new type of non-rusting sheets for siding and roofing has been developed and placed on the market by the New Jersey Zinc Sales Company, 160 Front Street, New York City. The sheets, sold under the brand name of Zilloy, are composed of zinc and small percentages of other non-ferrous metals and are sold uncoated. The producers state that Zilloy requires no special method of application, being fastened to frame by strips and rivets in standard fashion. They are stated to be sufficiently flexible for conformity to the ordinary unevenness found in industrial building construction and other applications.

The makers state, furthermore, that Zilloy has sufficient strength to prevent sagging and creeping which is known to occur in many types of roofing when subjected to snow loads, accumulation of dust, etc. Full details as to this material, methods of application, etc., are available from the New Jersey Zinc Sales Company.

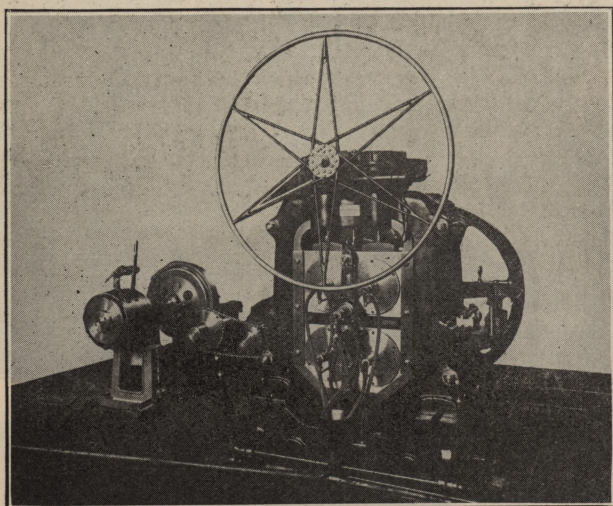
New Type Cluster Mills Developed in Germany

While its use has not been pre-eminently successful, a type of mechanism known as a cluster mill has been in use in Switzerland for some thirty years. There it has been used chiefly for producing high carbon strip steel for the manufacture of watch and clock springs. The cluster mills used are composed of a pair of working rolls of comparatively small diameter which are backed up by four rolls of larger diameter. The larger rolls serve to prevent the smaller working rolls from springing.

This type of machine has now been developed for use in other lines of industry. Before the war some of the

that the tolerance in gauges will not be more than a quarter of a thousandth of an inch all over the full width of the strip or sheet.

These new mills have been placed on the market in various sizes by Schmitz and Company, Fabrique de Laminoirs, Thun, Switzerland, with main works in Dusseldorf; also Walzmaschinenfabrik August Schmitz, Dusseldorf. These firms are represented in the United States and Canada by F. W. Jaeger, 140 Liberty Street, New York.



Improved Cluster Mill Developed in Germany

preliminary experimental work was performed at Dusseldorf, Germany, by the Walzmaschinenfabrik August Schmitz, but this work was interrupted by the entry of Germany into the war. However, since the war the company has taken up the work again and has developed a line of cluster mills ranging up to fifty inches in width which are said to be giving very satisfactory service in brass working operations.

It is claimed that this type of machine has been found capable of rolling brass strip of eight inch width and .060 inch thickness into strip of .017 inch thickness in two passes and without intermediate annealing. Normal two-high mills for this type of work generally require at least four passes and one intermediate annealing to accomplish the same result. Strip of $4\frac{1}{2}$ inch width has been rolled in three passes from .024 inch to .0045 inch without any intermediate annealing, whereas on normal two high mills seven passes at least are necessary with three annealings.

The edges of the rolled strips remain clean and are not torn at all, the makers state, which is presented as proof that the reductions have not been exaggerated.

The big backing-up rolls are placed in roller bearings, while the small working rolls have no bearings but are being kept in position by the backing-up rolls. There is consequently no consumption of oil for the lubrication of the bearings, the roller bearings running in grease which lasts for several months and the small rolls working with bare necks.

There is still another advantage in these mills, the metal turned out is much more uniform in thickness than it has been possible hitherto to produce, it is claimed. The bending through of the working rolls or the spring is next to nothing, so that every guarantee can be given

Philip Sievering, Inc., Expands

Philip Sievering, Inc., 195 Lafayette Street, New York City, operating one of the largest job plating plants in the eastern part of the United States, plans expansion of its facilities by the addition of a new floor of the building in which it is now located. This floor, immediately below the two lofts now occupied, contains about 8,500 square feet of space and will give the company a total of more than 25,000 square feet of working space. It is planned to locate all barrel plating operations on the new floor and install additional still tanks in the space vacated by the removal of present barrel plating equipment. New equipment, including a new generator of 3,500 ampere capacity and a number of new still and mechanical plating tanks, will be installed in various parts of the plant and all of the company's plating and finishing facilities will be enlarged, including chromium plating equipment. The company does electroplating of every kind, as well as polishing, buffing and other forms of finishing work. The firm was established in 1899 and continues to be operated by Philip Sievering, Sr., and his three sons, all of whom are actively interested in the activities of the company.

Coloring Metals

Q.—We have been endeavoring for some time to color or stain the Monel metal side of a bimetallic strip that we manufacture and at the same time leave the steel side bright and clean. This is done to distinguish the two surfaces.

What we desire is either a simple heating method or a quicker working dip by which we can rapidly produce the desired effect on long lengths of stock a couple of inches wide.

The two enclosed samples will serve to illustrate the stain we are seeking, as well as to furnish you with material with which to experiment if necessary. We have tried various coloring solutions, but they either stain both sides or rub off.

A.—It is quite a difficult proposition to produce a finish on the monel side of the strip and as you are only interested in a finish that will make the Monel side readily distinguishable, we would suggest the use of a solution of 4 oz. of copper sulphate and 2 oz. of sulphuric acid to one gallon of water, to color the steel side.

If the strips are clean, they can be immersed in the solution for a few seconds or the solution can be sponged or sprayed on the steel side of the strips, when a clean bright deposit of copper will be obtained. If a dark color is wanted, the strips, after being coated with copper, can be immersed in a dilute sulphide solution, and a brown to black color will be produced. The sample returned to you was finished this way.

—OLIVER J. SIZELOVE.

New Metal Compound for Wire Drawing Dies

By Dr. JAMES SILBERSTEIN

Metallurgical Engineer

IN the drawing of metal wire, diamond dies are used for fine wires. For heavier wires the dies are made of white iron, since diamonds—which would make far more satisfactory dies—are too expensive when their size is so big as to take in a hole of a diameter of .090 to .250 inch. The common procedure is, therefore, to use white iron dies from the rod size down to a thickness of .081 inch. From that size down the wires are drawn on diamond dies.

It has been desired for a long time to find a metal or a compound, which is superior to the white iron. The white iron die, although very cheap, wears too rapidly and is good only for 250 to 800 lbs. of wire. Secondly, since the die is reamed to shape by an ordinary reamer, it is never absolutely round, and the subsequent drawing on the diamond dies is therefore rendered more difficult.

After considerable research work a metal compound has been developed in Germany, which is being very successfully used in the drawing of any kind of metal wire, alloy wire and steel wire. As a matter of fact, today 95 per cent of the wire drawing mills in Europe are

using these dies for drawing down from rod size to .064 inch, and in cases of steel to much smaller sizes. The wire produced is of uniform size, and round, just as if drawn on diamond dies. There are records, showing that actually 1½ million lbs. and more wire has been drawn on a single die. These dies have, furthermore, increased the production capacity at least 20 per cent. Another advantage of using these dies is the improvement in the quality of the wire. The subsequent drawing on diamond dies is made much easier because of the better product being fed to them.

Tungsten carbide, which has a hardness almost equal to that of diamond, is one of the main constituents of the new dies. A great difficulty in the development of these dies was the brittleness of the compound. This difficulty has, however, been overcome. Since the metal fabricating industry during the last years uses harder wires to a much greater extent than was formerly the case, and since the drawing of hard wires is rather expensive when using the old white iron dies, the new development must be considered as a rather valuable one.

Electric Furnace Operation Filmed

The Ajax Electrothermic Corporation, Trenton, N. J., makers of the well known Ajax-Northrup high frequency induction furnaces for melting metals, with the enterprise that has always characterized the activities of this company, has just prepared a motion picture film showing induction furnaces in actual operation and also giving a graphic and intensely interesting explanation, by means of pictures, of the manner in which electrical energy is used on the charge in the furnace. The equipment manufactured by this company, as founders and metal men are quite well aware, is entirely different in operation from all other types of electric furnaces such as the arc types, for example.

To those who are familiar with the operation of Ajax

furnaces, the film will provide especial interest by virtue of the ingenious means the makers have found for showing Faraday's "lines of force." This has been accomplished by means of ink lines drawn across a sectional view of the furnace. The accompanying illustration, Figure 1, demonstrates how the lines are represented, and it is stated that in projection of the film the audience is given a very good representation of how the lines actually build up and collapse. The essential parts of the furnace are marked, as in Figure 2, and the pressure caused by repulsion of the charge from the coil is shown by the arrows in Figure 3. The flow lines in the molten metal are indicated in Figure 4, where the positions of the short lines changes as the film progresses, indicating four swirls of molten metal in the furnace.

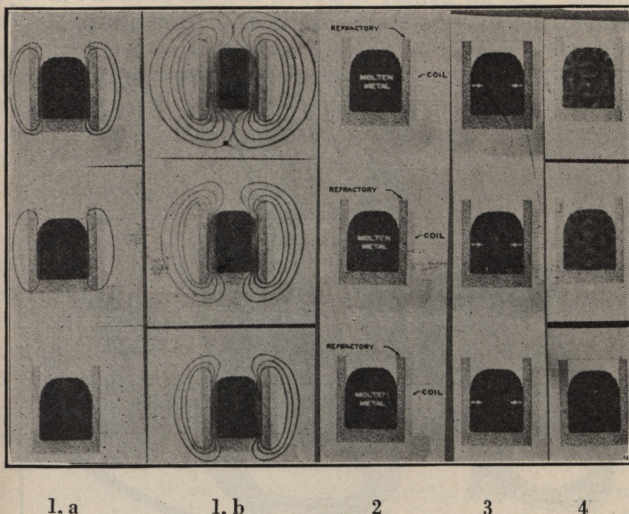
The Ajax company states that an effort has been made to minimize the advertising factor. Furnaces are shown in actual operation in the plant of the Ajax Electrothermic Corporation and in the Edgar Allen Steel Company, Sheffield, Eng.

The old method of melting in crucibles is shown so as to make vivid the comparison between this primitive, hot and disagreeable method with the new, clean and efficient method made possible by the invention of the coreless induction furnace.

The 150 kw., 600 lb. furnaces at the Heppenstall Forge and Knife Company are shown with a separate picture of the electrical equipment.

Two 1,000 lb. furnaces at Babcock and Wilcox Tube Company are also shown.

The application of the coreless induction furnace to the heating of metals for forging is shown, and it is quite striking to see white hot steel coming from a cold furnace. The method of putting linings in 500 lb. melting furnaces is illustrated by flashes of the essential parts of the operation.

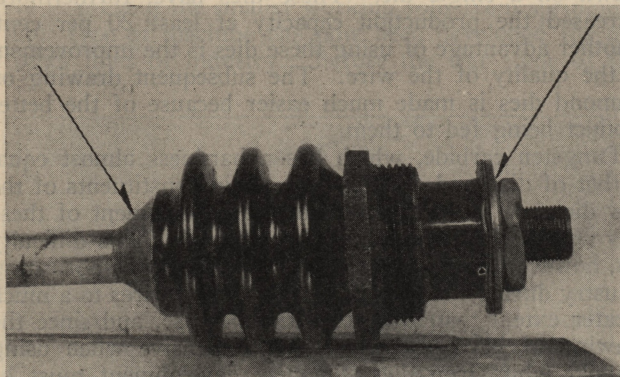


Figs. 1, a and b—Lines of force on cross-section of furnace. Fig. 2—Cross-section of furnace. Fig. 3—Section of furnace with molten charge, showing resultant pressure causing stirring. Fig. 4—Succession of lines, showing stirring motion.

Soldering Metals to Porcelain by New Process

The Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., has developed a process whereby metals can be soldered to porcelain without fear of weak joints or other disadvantages formerly making this work difficult if not impossible. The company describes the development in a recent publication, in which it says:

Of all insulating material, porcelain is perhaps the



An Oil-Tight Bushing, Metal Soldered to Porcelain.
Arrows Show the Points Soldered

most important used on the outside of machinery; but the smooth, hard glaze which is so useful in insulation has made a tight, strong, mechanical joint very difficult. Cement is the main standby, but cement is not as strong

as porcelain because it takes up water and is neither good insulator nor good conductor.

Metals can now be soldered to porcelain by a process which gives a joint that is stronger than porcelain, and so tight against air and liquid pressure that it will hold a high vacuum. Being metallic, the joint will not take up water, and being a good conductor, it equalizes insulating stresses on the porcelain near it, thus often increasing its actual insulating value.

Recent tests on a subway transformer bushing showed notable results.

In torsion and in shear, the porcelain tore in two with the soldered joint still holding; in shear at about 3,000 lb. per sq. in.

A similar result was found with a cantilever stress of 3,180 in.-lbs., the porcelain failing at the edge of the solder.

After 5 minutes of air pressure at 80 lb. per sq. in., the joint was vacuum tight. The "standard ice-box test" of zero to 65° C. cyclic changes left it unhurt.

A 10,000 ampere short circuit on the stud (normal rating 1,200 amp.) after a minute or two melted the solder from the stud, but not from the porcelain.

The new soldered seal is recommended for use in mercury rectifiers, and in all sorts of cable and subway fittings, potheads, bushings and the like, especially in view of the use of oil-filled cable.

Successful application, though simple, requires skillful and experienced technique, and operators must be carefully trained.

Small Paint Spray Equipment

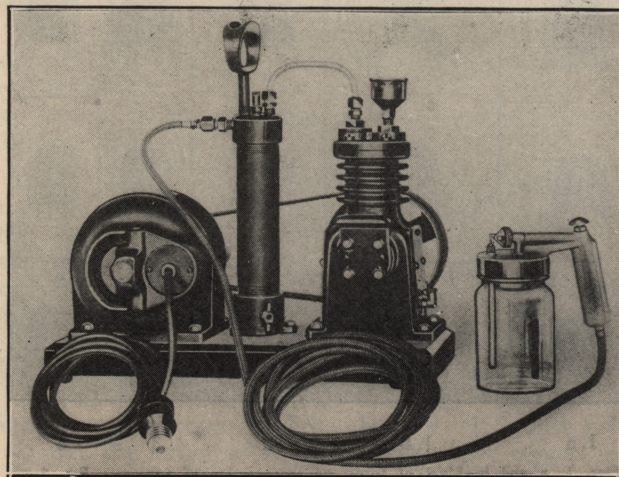
The DeVilbiss Company, Toledo, Ohio, well known originators and manufacturers of various types of equipment for the application of finishes to metal and other surfaces, have just perfected and placed on the market a small paint spraying outfit which was designed specifically to meet the needs of users who desire a compact, easily operated, economical painting mechanism. The makers state that the number of such users is very large and that despite this fact, the great variety of uses to which the new type of apparatus may be put has been kept constantly in mind by the engineers developing the outfit, so that it will be found suitable by practically anyone who desires to coat or color metal, wood, rubber, glass or products made of other substances.

In announcing the new mechanism, the DeVilbiss company says that never before has there been such a universal interest and activity in the production of painted and decorated products as there is today. The fact that new materials and new equipment for easy application of modern paints, enamels, and lacquers enable any merchant or manufacturer to economically and successfully enhance the appearance of his products probably has much to do with the present popular interest in such work and the fast-increasing use of color in finishing or manufactured products.

Many shopkeepers and makers of devices and products have found that the use of color in finishing operations stimulates sales, and the popularity and easy use of color have turned many a business into a more profitable operation for the owner.

The company's new outfit, known as the NC-601, is

described as being highly efficient, durable, inexpensive and entirely capable of performing even intricate and important spraying operations despite its small size. It is sold complete with air compressor and is ready for use when plugged into an ordinary electric light socket. It delivers a finely atomized spray adjustable from a round spray to a fan spray 3½ inches in width. This outfit weighs only 47½ pounds, and can be carried from place to place. The air supply is ample, and the pressure always constant, the makers state. It is said to conform to the



New Type Small Paint Spray Outfit

character, quality, and efficiency of the larger DeVilbiss outfits, which are in use today in large painting and finishing operations.

Some idea of the wide scope of utility of this outfit can be gathered from the fact that it is being sold to factories, garages, stores of all kinds, apartment houses, hotels, hospitals, institutions, public buildings, auto service shops, theatres, art studios, churches, public halls, service departments of manufacturers, painters and decorators, plumbers, furniture dealers, shops of all kinds and also to home owners.

Cleaning Lead for Copper Plating

Q.—Can you help us solve a little trouble which we have in copper plating lead plates used on trophy shields as as per enclosed illustrations? We have no trouble in the plating itself, but experience difficulty in making it stick to the lead surface while engraving the names of the winning team, etc. The copper plating peels off as soon as we start engraving. We enclose a sample plate to better illustrate our trouble.

What can we do to properly prepare the plate to make the copper stick?

A.—Examination of the sample shows you have very poor adhesion and that once the plate has been broken, the rest of the copper plate can very easily be peeled off. In addition, the lead surface is very dark and stained. To overcome this, we would recommend that in addition to your regular cleaning methods, you include the following:

After cleaning and when ready to place in cyanide copper solution, place it instead into a cold electric cyanide cleaner consisting of sodium cyanide, 6 ozs; water, 1 gallon; use steel anodes. This action will brighten up the lead. Then place into a nickel solution for 15 minutes and then into your acid copper solution. Leave out the cyanide copper entirely.

—JOSEPH HAAS.

Tin Solution

Q.—I have the following ingredients for making up a tin solution: sodium pyrophosphate, powdered; potassium bicarbonate, powdered; cream of tartar; sodium stannate, tech. powder; potassium hydroxide, purified; caustic potash, sticks.

Will you please state what amounts of each of these chemicals are required for one gallon of tin solution?

A.—In making up a tin solution, use the following formula, dissolving in water in the order named:

Water	1 gallon
Stannous chloride	2 ozs.
Rochelle salts	1 oz.
Sodium hydroxide	2½ ozs.

The list of chemicals you submitted for composition of a tin solution is entirely unnecessary.

Operate the above solution at 1½ to 2 volts, with a current density of 5 to 8 amperes per square foot of work surface. The solution operates best when used warm, at a temperature of 110 to 120° Fahrenheit.

—JOSEPH HAAS.

Navy to Sell Surplus Metals

A sale of United States Navy surplus and surveyed material by public auction will be held at the Navy yard, New York City, N. Y., on Wednesday, June 5. The catalog includes 300,000 pounds of various non-ferrous metals and quantities of pipe and fittings, mess gear, boat and ship fittings, electrical material, office equipment and a great deal of other goods not in the metal lines. Copies of the Catalog, No. 646A, may be obtained from the Supply Officer, Navy Yard, New York City.

Exposition of Chemical Industries

A large number of metal manufacturers, fabricators and other concerns directly connected with the non-ferrous industries, and also many companies manufacturing plating chemicals and other materials or supplies for the electroplating industry participated in the twelfth Exposition of Chemical Industries, held during the week of May 6 at the Grand Central Palace, New York City. As usual, it was one of the largest and most interesting expositions to be seen in New York. Many new and interesting developments in chemistry, metallurgy, mineralogy and kindred fields were shown and the tremendous importance of chemistry in the modern world was once more impressed upon the thousands who attended.

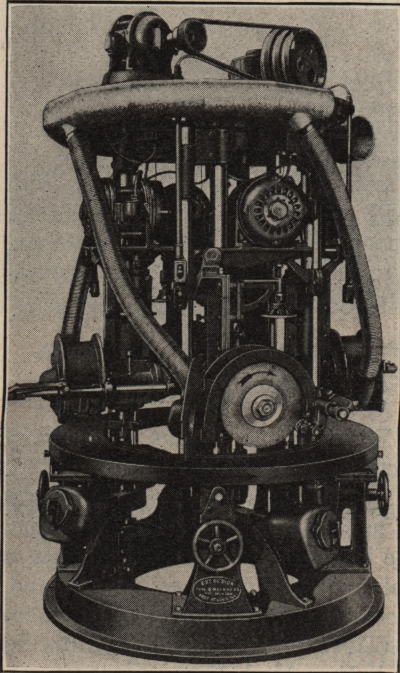
Of chief interest to the plating and finishing industry were the exhibits of the following concerns: United Chromium Corporation, showing various applications of chromium plate; Roessler and Hasslacher Chemical Company, manufacturers of plating chemicals; General Tank Company; Industrial Development Company; Foxboro Company, solution control instruments; Hoke, Inc.; American Hard Rubber Company; U. S. Stoneware Company; General Ceramics Company; Harding Company;

Sholes, Inc.; United Lead Company; L. O. Koven and Brother, Inc.; Leeds and Northrup Company; Sprayco, Inc.; Duriron Company, alloys, fittings, etc.; International Nickel Company; Brown Instrument Company; Gross Lead Burning and Coating Company; Norton Company; Hauser Stander Tank Company; Kuttroff Pickhardt and Company; Merck and Company; Bristol Company; Willson Products, Inc.; General Electric Company; Chadwick Boston Lead Company.

Some of the above named concerns had exhibits of interest also to the foundry and metal working industries, while a number who exhibited were confined particularly to the non-ferrous industry. Among these were: Quigley Furnace Specialties Company, showing fire-brick; Vanadium Corporation; Burgess-Parr Company; Elkon, Inc.; Victor Hybinette; P. R. Mallory and Company; Ajax Electrothermic Corporation; Mutton Hollow Fire Brick Company; Blaw-Knox Company; Wolf Company; L. W. Gibbons; Bethlehem Steel Company; Abbe Engineering Company; Tolhurst Machine Company; American Institute of Mining and Metallurgical Engineers.

Combination Grinding and Polishing Machine

The Excelsior Tool and Machine Company, East St. Louis, Ill., have placed on the market a newly designed combination grinding, polishing and buffing equipment known as the No. 26 Excelsior rotary feed, four-wheel automatic type. The makers state that this machine is suitable for rough grinding, polishing or buffing flat, semi-flat and other articles such as castings, forgings, stampings, sheet metal parts, electric iron base plates and other similar work, the capacity of the machine and suit-



Newly Designed
Rotary Feed, Four-
Wheel Automatic
Type Combination
Grinding, Polish-
ing and Buffing
Machine

able containers or magnetic chucks being provided to conform to the needs of the user. The makers state that in designing the equipment they have been especially careful to omit nothing that would add to its efficiency, economic application and appearance, and that at the same time every bolt and attachment is necessary to make it a complete unit for its purpose.

In operating this machine the rough and finished product is inserted and removed in the same position by one operator if four wheels are used. If one or two wheels is sufficient for the finish required the capacity of this machine is increased accordingly by two or four operators. Other claims made are as follows:

The wheel spindle, guard, wheel truing attachment and belt tightening device of each unit is self-contained and can be adjusted so that the grinding wheels can be set at an angle. The speed of the wheels can be changed from 1800 to 3000 R. P. M. by changing the motor pulleys. The height from the table to the wheels is regulated by the hand wheel adjustment in front of each unit. The wheels can be raised off the work and automatically locked in upper position so that the grinding wheels can be changed without interfering with the production of this machine.

Each unit is balanced by adjustable weights so that any desired pressure can be applied to each grinding wheel; at the same time the wheels are free to raise if the material to be ground is of uneven thickness, thereby relieving the grinding wheels of any undue pressure. There are 4 large upright shafts firmly secured to the upper and lower housings on which each unit slides, long

adjustable bearings are provided with supports for the guide bars clamped to the main support shafts.

The feed table is driven by internal gear and pinion connected to the worm reducer which is belt connected to the motor with 3 step cone pulleys for variable table speeds, 5, 9 and 13 lineal feet per minute. Motor speed, 900 R. P. M. The working parts are of dust proof construction. Each wheel is furnished with dust hoods and flexible spouts connected to upper suction pipe, depending on the kind of work and wheels used.

Structural steel wheel guards and wheel dressers are furnished when solid grinding wheels are used. If the machine is intended for wet grinding only, the dust collectors are not furnished and if for polishing only, the dust hoods are of a lighter construction. The motors are connected in the conduits to magnetic switch boxes with push button control for each wheel.

Manganese Bronze Withstands the Sea

Manganese bronze plates which were manufactured by the Taunton-New Bedford Copper Company, Taunton, Mass., and applied fourteen years ago to the hull of the famous yacht "Resolute," are reported to have resisted continuous immersion in salt water for the best part of that number of years without having any protective coating of paint or other substances. The plates, after fourteen years of such use, show no signs of corrosion by the brine, which is one of the most corrosive of all natural elements.

It is of interest to note, in this connection, that the copper sheathing for the celebrated ship, "Old Ironsides," was supplied more than one hundred years ago by the antecedents of the Taunton company, which traces its history back to the firm founded by Paul Revere, the swift-riding patriot of the American revolution. The Revere company has gone through a number of corporate changes since colonial days but some of its officials are direct descendants of the famous Paul. Some months ago the Taunton firm merged with a number of other companies to form the General Brass Corporation.

Current for Plating from Light Socket

Q.—Can you provide instructions for the electrical arrangements necessary for electroplating gold, silver, nickel and copper directly from the light socket? In New York we once had such an arrangement, but in the Middle Western city where we are now located we cannot find an electrician who knows how to do this. We would like instructions for our electrician.

A.—When you did your electroplating in New York, you undoubtedly were in the lower downtown district where you had direct current. You did this by having 8 or 12 lamps in series with your lighting circuits. This is a very expensive and unsatisfactory method of electroplating and is only used by amateurs.

In most Mid-West states alternating current is the source of light and it is impossible to plate with this without using a transformer.

Since you are willing to use the lighting circuit as a source, your electroplating requirements must be very small. We advise you to purchase a small motor-generator set for your purposes. The cost would not be more than \$85 to \$125, and in the end it would prove more satisfactory and less expensive. —JOSEPH HAAS.

Chromium Plating Fundamentals

A Discussion of Chromium Plating in All Its Aspects, Theoretical and Practical—Part 10*

By P. E. EDELMAN

Electrical Engineer

WRITTEN ESPECIALLY FOR BRASS WORLD

Finishing Work

THE finishing of chromium plated work falls into the following classes:

1. Bright Plated Articles, not buffed.
2. Dull finished articles, polished.
3. Heat treated parts, not buffed.
4. Bright finished articles, buffed.
5. Finished and lacquered.

Referring now to class (1) objects, a wide variety of work is salable without buffing. In this class are such objects as hardware trim, cheap stampings, etc. If the plated work was first smoothened before plating, a bright chromium plate or "strike" finish requires no buffing for such articles. A characteristic blue coloring usually is retained in the finished work when no buffing is employed. Probably a large bulk of the cheap chromium plated ware is now simply finished without buffing operations. Articles exposed to weather are however not suited to such simple treatment, though many headlamps for automobiles are sold in such unpolished condition.

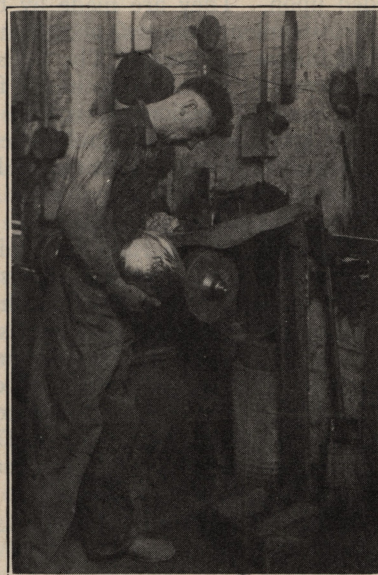
The second class of articles include parts subjected to much mechanical wear, such as printing plates, mechanical bearing and wearing parts, etc. Also much work which is dull plated by the European method, in contradistinction to the heated bath method largely used in the United States, must be polished after the plating operation when a high finish is desired. By use of finishing polishes specially prepared for chromium work, highly satisfactory surfaces with blue tints minimized in the coloring are obtained. These polishing preparations are usually sold in stick form under various trade names and vary slightly in composition and working characteristics. The fine polishing material used in such sticks is selected for the purpose and should be used rather sparingly to avoid streaky work. Buffing speeds and pressures will vary according to the articles to be polished and the foreman will customarily make determinations from a sample and instruct the polisher accordingly.

In the third classification are special tool parts, machine parts, etc. which are heat treated after plating of a rather thick coating. There are various modifications of heat treatment. Some workers in the art recommend heat treatment in a non-oxidizing atmosphere in order to attain higher temperatures such as 1000 degrees C. This treatment is usually limited to steel plated articles. Any heat treatment must be arranged to mitigate the oxidizing effect on the chromium, as even a temperature of 500 degrees C. will discolor a chromium coating to a purple and straw coloring. Excessive heat treatment may destroy much of the hardness of the chromium coating unless suitable precautions are taken to avoid oxidizing the metal. Heat treatment of plated parts is a subject that warrants further study in this art, as the requirements of automotive and aeroplane parts are accorded more attention than in the past. The tendency of mechanical coatings, in contradistinction to the usual thin plated

chromium ware, is to crack under continued stresses and shocks. Suitable heat treatment may largely avoid this characteristic and extend the mechanical utility of chromium plating. As regards the possibility of electrically deposited stainless steel alloys it appears that the electrolytic method cannot at present compete with the usual alloy process.

Coming to the fourth class of finishing, most of the automobile parts are in this grouping. Sometimes a green oxide of chromium is used as a polishing medium, but white sticks are largely used for fine finishes. Some operators use a soap such as whale oil soap to remove traces of buffing compound from the finished work, while others rely on soft textile wiping operation on fine work.

In the fifth class is a limited range of ornamental ware where lacquer is used, not because required, but because the trade concerned customarily requires a lacquer finish, to simulate other finishes which are lacquered such as high priced rare metal plated ware, highly ornamented



Polishing Chromium Plated Headlamps for Automobiles Made by the Studebaker Corporation.

fixtures, etc. Very few examples of lacquered ware are at present found on the market as this operation is practised to a limited extent in ornamented ware of intricate pattern largely as an ornamental finish.

White or Blue?

A much discussed question is the desirable coloring of finished chromium plated ware. White coloring is desired by many to simulate other metallic finishes but some customers prefer the characteristic bluish tints. The nature of the article and its use will largely determine the necessary finish for the market. Curiously, some articles, as for example, plumbing fixtures of certain types, are more salable in many localities, in bright blue coloring finish, in order to make the salability of chromium finished fixtures more evident to consumers. Many a home has been sold in recent months because of the lus-

*Parts 1 to 9 were published in our issues for August to December, 1928, and January to April, 1929.

trous finish of plumbing fixtures plated with chromium. A few retail stores of ornate character have utilized chromium plated trim for window and store front borders. A large field appears to await the marketing of chromium surfaced sheet metal and castings for expensive store and bank building fronts as bronze or copper alloys are notoriously hard to maintain and lacquers are unsatisfactory for exterior trim.

Washing

Usual washing operations with circulated water supply are satisfactory for chromium plated ware. Ornamented surfaces however should be thoroughly washed with a force spray under considerable pressure so that traces of chemicals will not precipitate in crevices and discolor the work.

Polishing

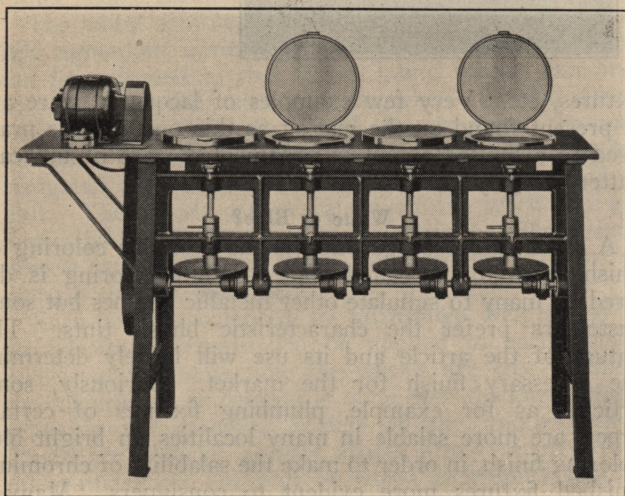
There is nothing especially romantic about polishing. It always requires a certain rough knock. Worn buffs must be discarded so that an even surface is replaced for contact with the work. Some suitable form of dust hood or suction duct is required for sanitary reasons. Certain articles may be adapted to machine or semi-automatic buffing but the ordinary run of job work must be handled by hand. A mild cleaner followed by wiping with soft textile material will afford ample finishing of buffed work for most articles. A light working pressure of the ware against the wheel is recommended for the finishing. This is particularly the case for thinly plated ware.

This series will be continued in an early issue.—Ed.

Polishing Machine for Metallography

The accompanying illustration shows a machine for polishing metals. This machine, manufactured by the Warner and Swasey Company, instrument makers, is distributed by the Chemical Rubber Company, Cleveland, Ohio, who have just issued a complete description of the apparatus. They state that the machine was developed originally by Warner and Swasey for their own use, and soon found favor with others who needed such an apparatus. The demand grew and commercial production of the machines was decided upon. They are made by the mechanics of the optical instrument concern, accustomed to producing apparatus of highest accuracy. The polishing machine is used for preparing metallic specimens for microscopic and micrographic examination. It is said to embody the advantages of speed and ease, having been designed by a metallurgist and built with great care. Its chief features are summarized as follows:

Each of four bronze polishing plates is constructed so that its speed may be varied from 285 to 1525 r.p.m., independent of the other plates. Bronze bearings are used throughout, and one 80 grain grinding wheel is furnished with the machine which has a solid oak table. The polishing plates are enclosed in an aluminum bowl which prevents the splashing of grinding powders from one wheel to another. There is also an aluminum cover to protect each plate from dust and dirt when it is not in use. The whole outfit comes completely equipped with a motor and set up ready for operation.



Metallographic Polishing Machine

The machine is said to operate quietly and to be of desirable appearance as laboratory apparatus. Among the users in the nonferrous metal field, the company lists the Ohio Brass Company, Western Cartridge Company, Taunton-New Bedford Copper Company, General Electric Company and many others.

Silver and Chromium Plating

Q.—Please give me information on how to make a silver solution and what kind of tank to use.

How can I make a chromium solution? What kind of tank is best for 200 gallons and what is the best method of heating solution?

How can I make what is called a silver oxidized finish? The sample I have is a grayish finish with black in the flower parts; the highlights are gray satin and some are white with flower parts in bright black. Some call it a nickel silver finish. How is this finish made? Is it lacquered?

A.—If you had given us information on what kind of work you intended to silver plate, we could give you more definite information. As it is, all we can give is merely the formula. Silver strike solution: silver cyanide, 1 oz. Troy; sodium cyanide, 8 ozs. avoirdupois; water 1 gallon. Silver solution: silver cyanide, 5 ozs. Troy; sodium cyanide, 10 ozs. avoirdupois; sodium carbonate, 2 ozs. avoirdupois; water 1 gallon. Use either an iron tank with welded joints or a 3" cypress wood tank. Either should be lined with asphaltum.

For a chromium solution, use an iron tank lined with lead, or an iron tank only, and hang in separate sheets of lead as anodes. The tank should be jacketed and arranged with steam pipe for heating and cold water for cooling. The control of steam flow or water flow should be done by some of the special control instruments sold for that purpose. For a solution use chromic acid, 55 ozs.; sulphuric acid, ½ oz., water, 1 gallon. Current density, 75 to 100 amps. per sq. ft.; temperature 110 degrees Fahrenheit.

Your silver oxidized finish is produced by dipping the silver plated articles in hot liver of sulphur solution until black. After dipping, relieve the highlights by brushing over with a rag wheel moving at 800-1000 R.P.M., with a paste of fine pumice stone. Wash off pumice stone; dry articles and lacquer.

—JOSEPH HAAS.

Antique Iron and Bronze Finishes

Q.—Will you please give me formula which I could use in getting an antique iron finish on bronze. Also a way of getting a rough old greenish finish on bronze.

The bronze which I use is for hardware on outside doors and grills on high class residences. I am using cast bronze which I have made up to order at the foundry.

Kindly inform me as to which method would be the most satisfactory and the least expensive as I must compete with larger manufacturers' prices.

Any books or data that you think I could use to any advantage would be appreciated if you would write the titles down for me.

A.—There are various kinds of antique iron finishes. Some are made by nickel plating the metal then black nickeling and relieving to bring out the white of the nickel. After lacquering, it is toned with powders mixed with beeswax dissolved in turpentine. The powders generally used are finely ground browns resembling rust-dark grays, and black. Some firms make antique iron by oxidizing this metal black. Then, with the above mentioned powders and spar varnish, they daub up the surface to obtain the required effect. There are no good books covering the subject. It is a subject that is learned by varied experience.

To obtain a rough old greenish finish on your bronze, daub over the surface with a brush several applications of the following solution:

Acetate of copper.....	4 ozs.
Ammonium chloride	1 oz.
Ammonium sulphate	2 ozs.
Zinc sulphate	2 ozs.
Water	1 gallon

Allow to dry between applications. After 3 or 4 applications, lacquer; then, with the aid of spar varnish and various finely ground powders, yellow, brown, red, blue, daub over the surface to produce the effect you wish. Before the varnish has completely set, dust over with a cheesecloth bag containing rotten stone. You will then have duplicated the famous Pompeian verde antique finish.

The results you obtain will be entirely dependent upon your skill as an "artist." "Metal Coloring," by Hiorns, would be of value to you.

—JOSEPH HAAS.

Rust Prevention

Q.—We would be pleased to have your recommendations of the best method of covering polished stove parts to prevent rusting when warehousing or shipping to a salt water country. We are experiencing a great deal of trouble at present in getting these goods to their destinations without rusting.

We would also like you to inform us where we may purchase a rust resisting liquid.

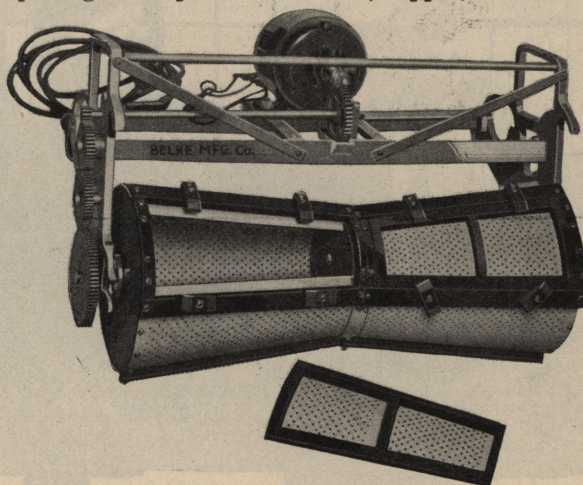
A.—One of the best rust preventives for your purpose would be a good grade of floor wax which is made of pure beeswax and turpentine and comes in the form of paste. The writer has seen stove parts that were covered with such wax and immersed in water for several months without showing any rust from the immersion. We are unable to advise whether the addition of yellow resin would improve the coating, but as yellow resin is soluble in turpentine its addition might be of value.

You could prepare your own wax mixture by dissolving beeswax in turpentine with the aid of heat and then adding a small amount of resin. The paste should be made the consistency of shoe polish and applied with a brush or cloth. It can readily be removed with gasoline when necessary to do so.

—CHARLES H. PROCTOR.

Rotating Barrel for Still Tanks

Several types of small mechanical plating barrels which are used in connection with large still plating tanks have been placed on the market by the Belke Manufacturing Company, Chicago, Ill., manufacturers of a variety of equipment for electroplaters, galvanizers, etc. The new types of barrels are equipped to provide for the needs of manufacturers who have small work which is customarily sent out for plating in plants where mechanical apparatus is maintained or who plate small parts by the more or less laborious method of stringing them up. The advantage of the rotating barrel over the still tank for plating small parts with nickel, copper, brass or other



Double Compartment Type of Small Mechanical Plating Barrel for Use in Still Plating Tanks

metal has long been known to the electroplater. The new Belke apparatus is designed to make it possible for plants where there are still tanks only to have an economical rotating barrel which can be placed on a still tank by a single operator and used to plate batches of small work whenever necessary or during periods when the still tanks are not in use on large work. The barrels are marketed under the name of "Midget" and are made in several sizes and types, including single and double compartment types.

These barrels are equipped with motors and can be operated directly from a light socket or else from the bus bar of the still tank. No baskets are required for handling the small parts plated as the complete barrel can be lifted from one solution to another and from solutions to rinsing baths. The finishes produced in these barrels, it is claimed by the makers, are brighter and cleaner than possible on small parts plated in still tanks. Durability and ease of operation have been constantly kept in mind by the designers, they state.

Solution Low in Metal and pH

Q.—I am sending you a sample of my nickel solution for analysis and suggestions as to any means of improving it, if you think it is not in good order.

A.—Analysis of nickel solution:

Metallic nickel	1.87 oz.
Chloride, as ammonium chloride.....	2.34 oz.
pH	5.2

Solution is a little low in metal and the pH is also too low.

Add 4 oz. of single nickel salts to each gallon of solution and 6 oz. of 26° ammonium hydroxide to each 100 gallons of solution.

—OLIVER J. SIZELOVE.

Preparation of Surfaces for Chromium Plating

The Hill-Curtis Company, Kalamazoo, Mich., manufacturers of polishing and buffing supplies and equipment, have issued some valuable information in regard to the polishing and buffing requirements of chromium



Buffing Automobile Radiator Shells in a Chromium Plating Plant

plated work. A special technique of polishing and buffing metal articles preparatory to chromium plating them has been developed due to the special properties of this new and increasingly popular finish, the company states. The preparatory finish must be nearly perfect as the chromium will not cover up defects in the basic surface it is deposited upon. It not only exactly reproduces all the underline polishing marks and scratches, but seems to magnify them. A polished surface of nickel or copper plate that appears faultless will show many polishing marks, seams, etc., after being chromium plated. Pits, seams, fan holes and all other defects that nickel or copper plate will cover must be completely polished and buffed before chromium is applied.

One of the most necessary essentials for polishing and buffing preparatory to chromium plating is proper speed of buffing wheels for each operation. The recommended speeds of polishing and buffing lathes are:

Grinding, 1200-1800 RPM.

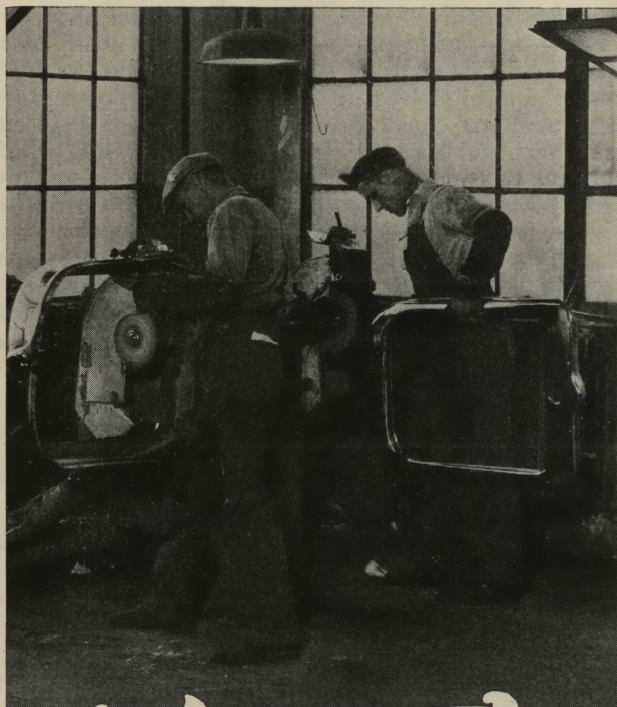
Polishing, 1800-2200 RPM.

Buffing, 2200-2700 RPM.

Chromium buffing, 2700-3000 RPM.

With the belt-driven lathe the above speeds are comparatively simple to obtain by using different size pulleys. In the newer and more modern shops, where plant engineers are striving to get individual drive wherever possible, eliminating overhead line shaft and unsightly belts, limited speed of a motor-on-spindle electric polishing and buffing lathe has been encountered. To overcome this, the Hill-Curtis Company has developed a machine known as the "Rite Speed." It has the motor mounted

on the pedestal, transmitting the power from the motor to the spindle by means of multi-V belts. With this design, the exact speed wanted can be obtained on alternating or direct current, without the use of excessive frequent changes. This machine is made in a wide variety of sizes and styles and in both the single and two spindle style of polishing lathe. The usual evils that accompany an overhead line shafting installation, such as oiling, cleaning of motors, etc., have been overcome, inasmuch as the motor is mounted as part of the machine, making it very convenient to get to, the makers claim. All dust



"Coloring" Operation, After Shells Have Been Chromium Plated

and dirt is eliminated from the motor by means of an air cleaner.

Vibration, one of the evils responsible for buffing and polishing marks in finished work, has been eliminated by the use of frictionless bearings. The lathes are equipped with large Timken taper roller bearings or ball bearings, on specification.

Unless the work comes from the chromium plating bath with a perfect finish, it is necessary to buff the surface. Also, it is often desirable to give additional snap to the surface. This process is called "chrome buffing," or "color buffing." For this operation the lathes should run at a speed of 2700 to 3000 RPM.

Proper Content of Nickel Solution

Q.—Please give me the proper metallic nickel content, content of chloride as ammonium chloride and the pH for a nickel solution that is used as a base for chromium plating.

A.—The solution should have the following proportions:

Metallic nickel 2½ to 3 ozs.
Chloride, as ammonium chloride.... 1½ to 2 ozs.

—JOSEPH HAAS.

BRASS WORLD

AND

Plating — Polishing — Finishing

Published Monthly by

THE BRASS WORLD PUBLISHING COMPANY, INC.

11 Cliff Street, New York

Telephone, Beekman 2306

SUBSCRIPTION RATES

Domestic, one year, \$1.00. Canadian, one year, \$1.50. Foreign, one year,

\$2.00. Single copies, current issue, 10 cents each.

ADVERTISING RATES ON APPLICATION

Issued about the 25th of each month

Forms close on the 15th

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Paying for Work

ONE of the problems which constantly presses upon the employer of labor is the question of how to set fair wage rates. Is it best to pay for time or for work turned out, or perhaps some combination? The subject calls for attention not only from the small operator but from the largest industrial organizations in existence.

Every progressive plant, large or small, has some incentive-producing plan. At one time the hourly or daily wage was the only one known; of course, it was the simplest possible method of payment. Then came straight piece-work with payment only on output. This had certain obvious advantages to both employer and employee but it had certain disadvantages also, which experience proved, militated against the continuance of good relations between employer and employee. Changes in method of manufacture, changes in design of the part being made and a wide variety of products with only a small output of each retarded the successful operation of a straight piece-work system.

Many other plans have been suggested and put into operation. The one most generally useful seems to be a combination of time and piece-work whereby a man is paid a definite hourly rate with a specified bonus for production over what is considered a fair day's work. To be sure, much depends upon the definition of the word "fair" and the care with which the rates are set.

Large organizations have additional features in their compensation plans. The General Electric Company for example, pays to all employees not in the higher salaried positions, with five or more years' service, a supplementary 5 per cent of their annual earnings. They have additional features, such as a pension trust, company financing for employees who wish to purchase homes, and others. This company's pay roll, however, amounted to \$134,000,000 in 1928. Consequently their methods must be judged by their size.

The important point is that the problem is receiving more and more attention from progressive and intelligent employers who realize that a disgruntled man is likely to be a poor producer, while the man without a grievance is likely to do better for himself and for others.

Chromium Plating Quality

REPORTS have come to us in increasing numbers, lately, of the large volume of chromium plating done throughout the United States, particularly on a small scale. Chromium plating is growing, but with its growth has come one of the bugbears not only in chromium plating but of all industry—poor work.

Strangely enough, the worst offenders who have come to our attention recently are not the small operators but the large ones. Organizations even as large as automobile producers, in getting estimates on chromium plated work, have stressed the factor of price, often placing their business at the lowest possible figure regardless of the reliability of the bidder. What chance does the reliable manufacturer have who is turning out a high quality plate?

It is time for purchasers of chromium plated products to wake up to the fact that they cannot buy a 50-cent plate for 38 cents. If they place business with the 38-cent bidder they will get a 38-cent plate, which may turn out to be worth just nothing at all to them. It is time also for the plating shops doing chromium work to come to their senses before it is too late, and save the industry before it goes into the hard-bitten region of nickel, copper and other common metals.

The slogan of the chromium platers should be "High Quality and Fair Prices."

Questions and Answers

All inquiries are answered in the order received and, whenever possible, the answers published in the next regular issue

Copper Plating Glass

Q.—Kindly give us a formula for copper plating sand-blasted opal and plate glass. We have been copper plating these glasses for some time but the trouble we find is that the heat and the weather affect them, causing the copper plating to peel.

A.—We believe that the customary method of plating glass plates such as yours is by the pouring method, in which two solutions are used: ammonical silver nitrate and silver Rochelle salts. After the coating of silver is applied, the glass plates are copper-plated in the acid copper solution. This method is quite successful and we are at a loss to understand why you should have trouble.

We would suggest that you investigate the cleaning and rinsing of your glass plates before you pour your silver solutions. If you should then still have trouble, let us know and we will outline the "fire" method.

—JOSEPH HAAS.

Defective Nickel Solutions

Q.—We are sending you samples of our black and bright nickel plating solutions. Will you please analyze and advise us as to the proportions of them?

The black gives us a very gray black. How can we correct this?

Will you kindly forward to us best formulas for cyanide and acid plating solutions?

A.—Analysis of white nickel solution:

Metallic nickel	1.86 ozs.
Chloride, as ammonium chloride ..	2.27 ozs.
pH	6.8

The pH of the solution is entirely too high. Add 6 ozs. C.P. sulphuric acid to each 100 gallons of solution.

Analysis of black nickel solution:

Metallic nickel	0.80 ozs.
Sodium sulphocyanide	2.59 ozs.
Metallic zinc	.16 ozs.
pH	6.2

Add 4 ozs. double nickel salts and $\frac{1}{2}$ oz. zinc sulphate to each gallon of solution. Use a very low current density.

Formula for acid copper:

Copper sulphate	28 ozs.
Sulphuric acid	4 ozs.
Water	1 gal.

Formula for cyanide copper solution:

Copper cyanide	3 ozs.
Sodium cyanide	4 ozs.
Carbonate soda	1 oz.
Water	1 gal.

As a brightener use 1 oz. of hyposulphite of soda to each 100 gallons of solution.

—OLIVER J. SIZELOVE.

Excess of Nickel in Solution

Q.—I am sending you a sample of a nickel solution used for job plating work. It has been giving trouble. It seems that it takes $1\frac{1}{4}$ hours to get an ordinary deposit out of this solution with a potential of $1\frac{1}{2}$ volts. Then the articles come out a dark grey color. The tops of the articles plated have a darker grey than the bottoms and sometimes there is roughness at the top. If I use a potential of 2 or $2\frac{1}{2}$ volts the deposit comes out a nice pearl grey and the dark grey at the top is nearly eliminated, but there is usually pitting at the bottom.

I have received complaints from automobile owners that rain causes dark brown spots on parts that I have plated in the solution in question. It is very difficult to remove the spots.

I would like to know what is in the solution and what causes it to act as outlined above. Can it be corrected in any way? I would also like to know what causes the dark brown rain spots.

Is there any truth in the statement that it is better to use a nickel solution high in metal than one of normal metallic content for plating work that is to be chromium plated?

A.—Analysis of nickel solution:

Metallic nickel	4.17 oz.
Chloride, as ammonium chloride ..	1.91 oz.
pH	6.2
Copper	trace

Your solution is quite high in metal for a still plating solution and the pH is somewhat too high.

We would recommend the addition of 3 fluid ounces of sulphuric acid to every 100 gallons of solution and also raise temperature of solution to 80° F.

All nickel plated surfaces if dirty and exposed to the rain will spot easily. For this reason most of the automobile work is being chromium plated.

A nickel deposit to be plated with chromium must be soft or else the deposit is liable to raise, and a solution with too high a metal content is not recommended, nor is one with too low a metal content.

—OLIVER J. SIZELOVE.

Extra Durable Nickel Plate

Q.—We are making a drink mixer the agitator shaft of which is made of cold rolled steel pressed into a brass coupling. The assembled shaft is cleaned in the regular manner, giving a copper flash and still-plated with nickel for 30 minutes.

Some mixers are equipped with a removable agitator for the purpose of easy sterilization. In your opinion, will this plate stand up for six months or a year if boiled three or four times per day, or do you suggest the use of Monel Metal or stainless steel?

A.—If properly nickel plated, we can see no reason

why your product should not stand up under the sterilization for considerably longer than the specified time.

We would suggest the following method of plating: Cleanse thoroughly and plate in nickel solution for $\frac{1}{2}$ hour; rinse in clean cold water; then plate in copper solution for $\frac{1}{2}$ hour. If a polished finish is to be produced, copper color the work; if not, this operation can be omitted. Cleanse thoroughly and plate in nickel solution for 1 hour. A deposit of this character should give you entire satisfaction providing solutions are in good operating condition.

—OLIVER J. SIZELOVE.

Finishing Large Sheet Copper Tanks

Q.—We manufacture a melting and tempering kettle which has a copper tank as an outside casing. This tank is made of 24 oz. copper sheet, cold rolled. We would like to know the best method to give this tank a finished appearance but not a polished finish, as polishing is too expensive for this product. We would like to get a finish similar to that on the copper boilers now on the market.

This tank is too large and heavy to handle by hand but we thought we could use a flexible shaft to grain the copper.

Can you give us any information on this subject?

A.—To the best of our knowledge, articles such as yours are usually made of sheets that have been polished or grained before being bent into shape. Definite information can be obtained as to machinery by reference to manufacturers, many of whom advertise in BRASS WORLD and THE METAL INDUSTRY.

—JOSEPH HAAS.

Inefficient Chromium Solution

Q.—We are sending you samples of our chromium solution which we would like you to analyze. It lacks throwing power and seems to be generally deficient in operation. Can you tell us how to improve it in order to make it efficient?

A.—Analysis of chromium solution:

Chromic acid	20 ozs.
Tri-valent chromium	1.3 ozs.
Sulphate as sulphuric acid	.51 ozs.

Your solution is low in metal, high in sulphate ratio to chromic acid, and the tri-valent chromium is also quite high.

Add 30 ozs. of chromic acid to each gallon of solution. Procure a porous pot and reduce the tri-valent chromium, and do not add any more sulphate for some time to come or until another analysis has been made.

For this particular solution we would suggest a temperature of 100° to 110° F., and 100 to 150 amperes per square foot. A little experimenting will determine the proper temperature and current density to use.

—OLIVER J. SIZELOVE.

Maintenance of Chromium Solution

Q.—Is the following chromium solution in good condition? An analysis showed it to contain:

Chromic Acid	46 oz.
Tri-valent chromium	1.90 oz.
Sulphate as sulphuric acid	0.34 oz.
Iron	3.92 oz.

The tank, which is iron, is used as the anode. If the solution is in poor condition, can you suggest any remedies

to improve it? What affects the throwing power of the solution?

A.—Depositing chromium from the solution of which you gave the analysis, you are in a better position to state whether the solution is in good condition or not. If you have been having any difficulties, you should have stated what they were. That is just as essential, if not more so, than the analysis. Remember also that the chromium solution is a peculiar one, acting in many ways diametrically opposite from what would be expected from a knowledge of action of other plating solutions, so that as yet all its peculiarities have not been recorded.

Your greatest danger in affecting the efficiency of your chromium tank lies in an accumulation of trivalent chromium which increases the resistance of the bath, and for that reason we advise you not to use your iron tank as the anode but to use sheet lead as anodes. This will oxidize the trivalent chromium to hexavalent.

An increase in temperature will reduce throwing power. What temperature will give you the best results depends upon how great a throwing power you wish and at what current density you are operating.

Try to obtain copies of "A Study of Chromium Plating," by Richard Schneidewind, University of Michigan, Ann Arbor, Mich., and "Behavior of Plating Baths and Anodes During Deposition of Chromium," Trans. American Electrochemical Society, Columbia University, N. Y., Paper No. 16, April, 1928.

—JOSEPH HAAS.

Nickel on White Gold

Q.—We are sending you an optical frame part that has been white gold plated. We will appreciate it very much if you will tell us the formula for the genuine white gold solution used for this, and what anodes to use. We understand some firms are using an imitation white gold plating solution. Your full information will be highly appreciated.

A.—Sample optical frame has been nickel plated over a white gold base metal to prevent tarnishing. This method is used by some manufacturers of optical goods.

The proper method of making a white gold solution is to run the metal into solution from the anode, using the porous pot. The amount of metal is determined by weighing the anode at intervals. Use 18 karat white gold anodes.

—OLIVER J. SIZELOVE.

Rough Deposits of Nickel

Q.—We have been using what is known as the Watts nickel solution and it has given us considerable trouble by plating rough. Is this caused by high purity annealed anodes, and how can it be remedied? Filtering the solution only stops the defect for about 24 hours.

A.—It is quite difficult to give you a satisfactory explanation of your trouble without making an analysis of the solution. In general, it has been found that the type of anode you mention has a tendency to scale for the first few day's use, but when this tendency has been removed good results are obtained.

If the anodes disintegrate very rapidly, the trouble may be with the solution. Send sample for analysis and we will advise you further.

—OLIVER J. SIZELOVE.

Nickel Plating and Polishing

Q.—Is it possible to deposit a coating of nickel heavy enough to stand buffing and coloring without cutting through? I am plating steel and brass. Also, can the nickel be made not to strip off?

What kind of buffing wheels are best to use for polishing cold rolled steel before nickel plating?

A.—Nickel can be plated on steel or brass so as not to strip or be cut through in coloring. Use the following solution:

Nickel sulphate	16 ozs.
Ammonium chloride	2 ozs.
Nickel chloride	2 ozs.
Boric acid	2 ozs.
Water	1 gallon

Voltage, 1½ to 2; current density, 5 to 6 amperes per square foot. If your plate has been stripping, you have unquestionably been placing work into your nickel tank without properly cleaning it first.

The kind of wheels used to polish cold rolled steel or, in fact, any kind of metal, is dependent upon shape and form. Your question is such a broad one and so much would have to be written to cover all cases that we suggest you either call on a polishing material supply house or send us samples of your product. Then you can get specific information on how to polish your work.

—JOSEPH HAAS.

Peeling Copper Plate

Q.—I am sending you under separate cover a sample of a cyanide copper solution which I wish you to analyze. I wish to know what is in the solution as I have just taken charge of it and do not know its content and cannot get it to work properly without a great deal of trouble. At times it seems to be all right, especially when the copper plate is being buffed. But when the work is then nickel plated, the copper lifts off. It is a 225 gallon solution.

A.—Analysis of cyanide copper solution:

Metallic copper	4.40 oz.
Free cyanide	1.64 oz.
Carbonates	7.75 oz.

Solution is quite high in metal and carbonates but we do not believe that these factors are the cause of the deposit peeling. We rather think that the work is not properly cleaned before copper plating.

Warm cyanide copper solutions work more uniformly than cold ones. If the deposit is streaky, add 1 oz. of hyposulphite of soda to each 100 gallons of solution.

Do not add any more metal to solution for some time so as to reduce the metal content.—OLIVER J. SIZELOVE.

pH Determination

Q.—Our nickel plating bath is a hot Watt's solution containing 32 oz. nickel sulphate per gallon. Because of the deep color, we have had trouble getting an accurate determination of acidity. What method would you advise for determining pH? Would an ordinary comparator be satisfactory for such a solution?

A.—The most accurate method of determining the correct pH is with the hydrogen electrode. This method requires special apparatus which is quite costly. The colorimetric method, with a comparator set, is generally used in commercial practice and gives a fair reading.

—OLIVER J. SIZELOVE.

Single Nickel Salts Solution

Q.—I am starting to use the following nickel solution:

Water	1 gallon
Single nickel salts	2 lbs.
Sal ammoniac	4 ozs.
Boric acid	4 ozs.

Would you please tell me what voltage, amperage and time of work in solution for operating this bath? I also would like to know what the Baumé reading should be.

Is this solution a good one for general use, or would a double nickel salts solution be better? Do you think it has good throwing power? If you think I ought to change it, will you please outline the necessary additions and changes? Perhaps you would rather suggest another formula.

I am to use a tank of about 8 gallons capacity.

A.—The solution you outline will be satisfactory.

The amperage is governed by the amount of work surface you plate at any one time. You should have at least 5 amperes for each square foot of work surface. The voltage should be from 2 to 2½. The length of time you plate is entirely up to you. A good plate on brass would take from 45 minutes to one hour. On steel, it would take from 1½ to 2 hours.

Forget about Baumé; it does not mean anything.

—JOSEPH HAAS.

Associations and Societies

American Foundrymen's Association

HEADQUARTERS, 222 WEST ADAMS STREET, CHICAGO, ILLINOIS

Attend Foundry Congress Abroad

A considerable number of American foundrymen will attend the Third International Foundrymen's Congress which takes place at London, England, this year from June 11 to 15, inclusive. The International Relations Committee of the American Foundrymen's Association has just issued a list of those who have

arranged to go thus far and have expressed their intentions to the committee. About forty of these will constitute the official delegaton of the Association, which will leave London on May 27 for a pre-convention tour of Great Britain. The delegation is headed by the president, vice-president and executive secretary of the Association. The delegation sailed

from New York on May 10. The present list of persons from this country who are to attend to the Congress contains the following in the non-ferrous industries:

L. W. Olson, director, American Foundrymen's Association, of the Ohio Brass Company, and Mrs. Olson. C. E. Hoyt, executive secretary-treasurer, American Foundrymen's Association, and Mrs. Hoyt. George H. Wadsworth, Wadsworth Core Machine and Equipment Company, Akron, Ohio, and Mrs. Wadsworth. Joseph F. Froggett, The Penton Publishing Company, Cleveland, Ohio. V. E. Minich, American Foundry Equipment Company, New York. S. T. Johnston, president, American Foundrymen's Association, of S. Obermayer Company, Chicago, and Mrs. Johnston. Fred Erb, vice-president, American Foundrymen's Association, of Erb-Joyce Foundry Company, Detroit, and Mrs. Erb. William W. Paulson, Thomas Paulson and Son, Inc., Brooklyn, N. Y., and Mrs. Paulson. E. N. Cabaniss, Joseph Dixon Crucible Company, Jersey City, N. J. J. S. Law, Joseph Dixon Crucible Company. R. E. Kennedy, technical secretary, American Foundrymen's Association. M. J. Evans, Whiting Corporation, Harvey, Ill., and Mrs. Evans.

Edward Frohman, S. Obermayer Company, Pittsburgh, Pa. Herbert Weaver, Canadian Foundry Supplies, Ltd., Montreal, Canada. Robert J. Turnbull, Arcade Manufacturing Company, Freeport, Ill. John C. Pangborn, Pangborn Corporation, Hagerstown, Md. Frank Dodge, Werner G. Smith Company, Detroit, Mich., and Mrs. Dodge.

American Electroplaters' Society

HEADQUARTERS, CARE OF GEORGE GEHLING, 5001 EDMUND STREET, PHILADELPHIA, PA.

Detroit Convention Plans Prepared

CONVENTION HEADQUARTERS, CARE OF T. C. EICHSTAEDT, HOTEL SEWARD, DETROIT, MICH.

The seventeenth annual convention of the American Electroplaters' Society will take place at the Hotel Statler, Detroit, Michigan, July 8 to 11, inclusive, as previously announced. All preparations for the event are rapidly being planned and executed by the committee in charge of E. G. Levering, chairman, who is being ably assisted by a corps of active and capable members of the Detroit Branch, which will be the host at this year's convention. The general expectation is that Detroit will outdo itself in making the visitors at the convention comfortable and happy in their city.

A full report of the pre-convention details will be included in the May issue, when full information will be given as to accommodations, program of events at the convention, and other features. Those desiring information on any point in the meantime are respectfully referred to T. C. Eichstaedt at the address above, or to Horace H. Smith, 208 North Third Street, Newark, N. J., who is planning for a special car to carry eastern people to the convention.

New Branch at Los Angeles

HEADQUARTERS, CARE OF M. D. RYNKOFFS, 1354 WEST 25th STREET, LOS ANGELES, CALIFORNIA

The May meeting at the temporary Los Angeles branch was held on Wednesday, May 8th. Thirty-eight sat down to dinner, after which temporary president **Clarence Thornton** called the meeting to order. After business was disposed of, the meeting was turned over to **Charles Russell** for educational discussions. **Dr. Chandeysson** of St. Louis, Mo., gave a very interesting talk on plating generators, and upon request explained the difference between shunt and compound wound motors. **Charles Westen** of Chicago was also a visitor, and congratulated those present on their move to form a branch in Los Angeles.

John Jacques explained an article in the American Electro Chemical Society Review on the "Beret cathode test for determining optitruirium ratio of chromic acid to sulphate in chromium plating baths." This was of great interest to all present, and some

have already improved their chrome solutions by using this test.

Among the questions in question box was "How can white metal or brittania metal be silver plated without blistering." **Charles Russell** gave a good explanation of why this metal is hard to clean and suggested a strip composed of 11 ozs. sodium cyanide and 4 ozs. caustic soda; use reverse current; dip in straight muriatic acid; rinse; scratch brush or buff; clean in usual way; rinse; dip in 10% solution muriatic acid; rinse; strike in rich silver strike; then silver plate in regular solution.

From all indications, Los Angeles is going to have a lively branch. Any Californian desiring to join this branch should advise M. D. Rynkoffs, 1354 West 25th Street, Los Angeles, Calif.

Hartford-Connecticut Valley Branch

HEADQUARTERS, CARE OF VERNON GRANT, 43 PUTNAM STREET, BRISTOL, CONN.

The Hartford-Connecticut Valley Branch of the American Electroplaters' Society held its second annual education session and banquet at the Hotel Bond, Hartford, on May 11, 1929. More than a hundred platers, chemists and other industrial men attended the highly interesting session and there were over two hundred at the banquet in the evening.

The educational session, under the chairmanship of **George B. Hogaboom**, of Hanson-Van Winkle-Munning Company, Matawan, N. J., began at 2:30 p. m. The following program was given great attention and much discussion:

Spotting Out, by W. P. Barrows, American Electroplaters' Society Research Associate at the Bureau of Standards.

Stunts in Lacquering and Enameling, by E. M. Stephenson, The Henry V. Walker Company, New York City.

The Mechanical Side of Chromium Plating, by Walter Rowe, Manning Bowman and Company, Meriden, Conn.

The Corrosion of Electroplated Metals, by Dr. A. Kenneth Graham, Professor of Chemical Engineering, University of Pennsylvania.

The Application of Science to Electroplating, by Edson L. Wood, Landers Frary and Clark, New Britain, Conn.

Philadelphia Branch

HEADQUARTERS, CARE OF PHILIP UHL, 2432 NORTH 29th STREET, PHILADELPHIA, PA.

New Officers Elected

New officers of the Philadelphia Branch of the American Electroplaters' Society were elected at the regular monthly meeting held at the University of Pennsylvania, May 3, 1929. The following were named:

President, W. M. Scott; vice-president, S. A. Lunbeck; secretary-treasurer, Philip Uhl; librarian, A. Hirsch. The last two named were re-elected.

Board of managers: J. Underwood; H. Snyder; W. P. Scott.

Delegates: George Gehling, Philip Uhl and S. T. Lunbeck; alternates: P. Kurzeknabe, W. M. Berenato and A. J. Shaffer.

George Gehling, previous president of the Branch, was compelled by pressure of business to decline renomination for the office. He had been president of the Branch for eight years and is now supreme secretary of the American Electroplaters' Society. Mr. Gehling stated, however, that he planned to give as much time as possible to the affairs of the Branch and the Society in general.

After the business part of the meeting was concluded, a number of problems in the Branch's "Question Box" were answered by various members. There was a very large attendance.

PHILIP UHL, Secretary

Rochester Branch

HEADQUARTERS, CARE OF CHARLES GRIFFIN, 24 GARSON AVENUE, SYRACUSE, NEW YORK

Annual Session and Banquet

The seventeenth annual educational session and banquet of the Rochester Branch took place at that city on April 19, 1929. It was a highly successful event. A large attendance testified to the fine work done by the committee which arranged the session and the dinner.

At the session in the afternoon, **Frank Kolb**, chief chemist of the Bausch and Lomb Optical Company was the first speaker introduced by Clarence Reama, president of the Branch. Mr. Kolb spoke on various interesting topics and in conclusion he extended an invitation to all eligible men to join the American Electroplaters' Society.

George B. Hogaboom, of Matawan, N. J., conducted his famous "Question Box." To say that this went over big is to fail entirely to give Mr. Hogaboom the credit he deserves for his fine work at the session. It was the event of the day, and all the platers in Rochester are looking forward to the day when they will be able to enjoy the "Question Box" again.

After the session a good chicken dinner was served and this was followed by a very good vaudeville entertainment.

There was dancing until a late hour.

CHARLES GRIFFIN, Secretary.

Personals

Sam Tour, formerly metallurgist for the Doehler Die Casting Corporation and later engaged in general metallurgical consulting work, has merged his business with that of Lucius Pitkin, Inc., 47 Fulton Street, New York City, analytical and consulting chemists, assayers and metallurgists. Mr. Tour has been

elected a vice-president and a director of the company and will devote his entire time to the firm's work on problems relating to the working and heat treating of metals, where his extended and varied experience will enable the company to better its service to the metal industries. Mr. Tour is a past chairman of both the New York and the Washington Chapters of the American Society for Steel Treating, secretary of the A. S. T.



Sam Tour

M. Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys; a member of the American Institute of Mining and Metallurgical Engineers, the American Chemical Society, Society of Automotive Engineers, and the two organizations previously mentioned. Mr. Tour will take charge of what now becomes the Pitkin company's branch at 123 North Street, Batavia, New York.

Horace W. Gillett, Chief of the Division of Metallurgy of the United States Bureau of Standards, Washington, D. C., has accepted the post of director of the Battelle Memorial Institute, Columbus, Ohio. The Institute was founded for the promotion of research in science for the benefit of industry. Dr. Gillett graduated from Cornell University with the degree of A.B. in 1906. He worked in the laboratories first of Thomas A. Edison and later with Charles D. Little, Inc. Then he secured his doctorate and went with the Aluminum Castings Company, Detroit, Mich., as manager of research. In 1912 he became alloy chemist at the Bureau of Mines, Washington, D. C., where he remained until 1924, when he became Chief of the Metallurgy Division of the Bureau of Standards. He has done a great deal of work on furnaces, utilization of domestic ores and related subjects, and he is the author of numerous authoritative papers and monographs.

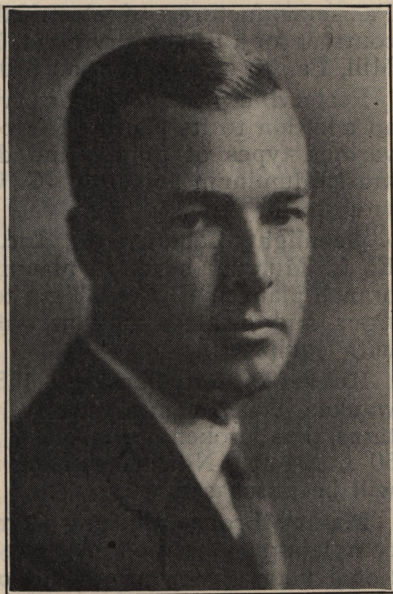
Louis J. Jenner has been appointed polishing sales engineer of The Federal Abrasives Company, Birmingham, Alabama. Mr. Jenner has had many years of experience in the polishing and finishing field, having started training under his father, who had charge of the polishing, buffing and plating department of A. G. Spalding and Brother years ago when they were bicycle manufacturers. Since that time, Mr. Jenner has been identified first with a large automobile company and then with a talking machine company, as head of polishing and plating departments.

George Gehling has taken an executive position with the Standard Plating Company, Philadelphia, Pa., after several years of service with the Elevator

Supplies Company, Hoboken, N. J. Mr. Gehling is widely known in electroplating circles as the secretary of the American Electroplaters' Society and, for the past eight years, as the president of the Philadelphia Branch of that Society.

It has been announced by the Tolhurst Machine Works, Troy, N. Y., that their New York City office has been moved to the Hudson Terminal Building, 30 Church Street. Concomitant with this move it is announced that **William T. Powers** will assume direction of the new office.

Mr. Powers has served as service engineer in the New England and the Mid-western territories. His wide experience in the application of centrifugal machinery to the process industries, combined with a thorough knowledge of both product and process problems, offers the manufacturer in or near New York exceptional facilities for service and counsel, the Tolhurst company states. The rapid development in centrifugal engineering that has extended the field of centrifugal machinery to include extraction, draining, clarifying, impregnation and thickening requires the services of such a specialist in New York City as Mr. Powers.



William T. Powers

August A. Busch, formerly president, has been elected chairman of the board of the Busch-Sulzer Brothers Diesel Engine Company, St. Louis, Mo. **Edward B. Pollister** succeeds him as president and will continue to act as general manager. **C. D. Jones**, formerly fourth vice-president, secretary and treasurer, succeeds Mr. Pollister as second vice-president and continues in his other capacities.

James Warren has resigned as works manager of the Rome Manufacturing Company, Rome, N. Y., effective May 31. Mr. Warren was manufacturing executive of the Lalance and Grosjean Manufacturing Company before going to the Rome company, and before that he was works manager of the Carnegie, Pa., plant of the Superior Steel Corporation.

Chester V. Nass has been appointed superintendent

of the brass foundry division of Fairbanks Morse and Company, Beloit, Wis. From 1923 to 1928 Mr. Nass was chemist and metallurgist for the Ohio Brass Company, Mansfield, Ohio, and just previous to accepting his new position he had been with the Humphreys Manufacturing Company, Mansfield.

Stephen S. Tuthill, for several years the active and widely known secretary of the American Zinc Institute, has resigned his position with that organization. Mr. Tuthill states that he has no immediate plans except for a vacation in the Adirondacks for a month or six weeks after August first, when his resignation takes effect.

Charles H. Proctor, associate editor of THE METAL INDUSTRY, gave an address before the Chicago Job Platers' Association on May 3, 1929. His subject was "Are We Justified in the Belief That Chromium Plating Is a Commercial Process?" A great deal of interest was manifested in Mr. Proctor's discussion of the topic.

H. J. French, formerly senior metallurgist of the United States Bureau of Standards, Washington, D. C., is now associated with the research and development division of the International Nickel Company, New York City. Mr. French's headquarters are at the company's Bayonne, N. J., research laboratory.

E. J. Hergenroether has become associated with the research and development department of the International Nickel Company and will make his headquarters in Detroit, Mich. He was previously connected with the Cadillac Motor Car Company as metallurgist.

A. P. Munning, 2nd, of A. P. Munning and Company, Inc., the Kobe, Japan, division of the Hanson-VanWinkle-Munning Company, Matawan, N. J., has returned to the United States to assume direction of the research department of the company at Matawan.

O. B. Stauffer has been appointed manager of the architectural department of the John Harsch Bronze and Foundry Company, Cleveland, Ohio. He was formerly sales manager for the Forest City Structural Steel Company, Cleveland.

S. D. Den Uyl has been elected to succeed A. P. Lauer as secretary of the Bohn Aluminum and Brass Corporation, Detroit, Mich. Mr. Lauer remains as a director of the company.

M. W. Elmendorf has entered the engineering division of the Taylor Instrument Companies, Rochester, N. Y. He was formerly associated with the Pfaudler Company, Rochester, N. Y.

Robert Murrell, foreman of the Magnus Metal Company, Topeka, Kan., for the past four years, has been promoted to the position of superintendent.

Business Reports in Brief

Springfield Bronze Company, Springfield, Mass., will build a foundry addition and install new equipment.

J. T. Rich has established a brass, bronze and aluminum foundry at 310 Tenth Street, Knoxville, Tenn.

Sully Brass Foundry, Ltd., Toronto, Ont., Can., has removed from 2388 Dundas Street, West, to 7-15 Wabash Avenue.

Fulton-Harwood Brass and Aluminum Company, South Bend, Ind., reports business is good and a recent increase in employees.

United Casket Company, 1958 Central Avenue, Cincinnati, Ohio, will soon award contract for a two-story factory. Estimated cost is \$40,000.

Carborundum Company, Niagara Falls, N. Y., will start work immediately on an addition to its plant in Ontario.

American Galvanizing Company, 83 Florence Avenue, Revere, Mass., has started work on a one-story plant, 50 x 100 ft.

Quigley Furnace Specialties Company has moved its office in New York from 26 Cortlandt Street to 56 West Fifty-fourth Street.

American Metallurgical Corporation, 27 Von Hillern Street, Boston, Mass., has changed its name to **American Electric Furnace Company**.

Eberhardt and Weidner, 2011 Fullerton Avenue, Chicago, Ill., will soon award contract for a one-story 50 x 50 ft. addition to their brass foundry.

Herald Publishing Company, Ltd., 15 Jurors Street, Montreal, Que., Can., is in the market for a nickel plating plant with large vats for heavy work.

Surface Combustion Company, 2375 Dorr Street, Toledo, Ohio, has awarded contract for a one-story, 170 x 180 ft. plant. Estimated cost is \$200,000.

Jones-Dabney Company, 1481 S. 11th Street, Louisville, Ky., awarded contract for a three-story, 50 x 80 ft. lacquer factory. Estimated cost is \$75,000.

Louisville Electrical Manufacturing Company, Magazine Street, Louisville, Ky., is planning a one-story addition to cost about \$25,000 with equipment.

J. C. Miller Company, Grand Rapids, Mich., plans the construction of a two-story polishing and plating material plant on Seward Street. Estimated cost is \$50,000.

Marine Wire Company's copper wire plant at Anderson, Ind., has been sold to the **Anaconda Copper and Cable Corporation** and extensive improvements are planned.

Herpers Brothers, 18 Crawford Street, Newark, N. J., manufacturers of jewelry, have plans for a two-story and basement addition, 30 x 60 ft., to cost about \$25,000 with equipment.

Master Electric Company, Davis Avenue, Dayton, Ohio, manufacturer of electrical equipment, is considering construction of an addition to cost about \$40,000 with equipment.

Bristol Company, Platts Mills, Waterbury, Conn., manufacturer of recording and measuring instruments, has plans for a one-story addition to cost about \$50,000 with equipment.

Texas Brass and Manufacturing Company, 1404 Elysian Avenue, Houston, Texas, will build a machine shop, 40 x 100 feet, and will enlarge its foundry. **D. D. Daugherty** is manager.

Bagues, Inc., 25 W. 54th Street, New York, manufacturer of wrought iron and bronze products, has leased part of the building at 333 West Fifty-second Street for a new plant.

Coleman Lamp Company, 238 St. Francis Street, Wichita, Kan., has awarded general contract for a four-story and basement addition, 60 x 160 ft., to cost about \$85,000 with equipment.

Electro Chemical Pattern and Manufacturing Company, 3975 Beaufait Avenue, Detroit, Mich., will erect a one-story addition, 30 x 70 ft., to increase its electrolytic copper plating facilities.

Michel and Pfeffer Iron Works, 10 and Harrison Streets, San Francisco, Cal., plans first unit of plant to include bronze foundry, etc., at South San Francisco. Estimated cost is \$200,000.

Michigan Smelting and Refining Company, 7885 Joseph Campau Avenue, Detroit, Mich., has awarded contract for a one-story, 150 x 300 ft. addition to its smelting plant. Estimated cost is \$125,000.

Blake Manufacturing Company, Springfield, Mass., manufacturer of flashlights and metal novelties, has taken a ten-year lease of its manufacturing quarters. Purchase of new equipment is contemplated.

Beaver Manufacturing Company, 625 North Third Street, Newark, N. J., manufacturer of electrical wiring devices and equipment, has plans for a two-story

addition, to cost about \$40,000 with all equipment.

Koretke Brass and Manufacturing Company, 922 Magazine Street, New Orleans, La., has plans under way for a new one-story plant for foundry and plating divisions, to cost about \$25,000 with equipment.

The Hardinge Company has removed its New York City offices to 122 East 42nd Street, Room 4011. The company manufactures conical ball, rod and pebble mills, dryers, thickeners, clarifiers and sand filters.

Walker Brothers, 1417 Sansom Street, Philadelphia, Pa., manufacturer of electrical equipment, has let contract for a three-story plant, 100 x 120 ft., at Spring Mill, Pa., to cost more than \$100,000 with machinery.

Porterville Foundry, Porterville, Cal., is building an addition to its plant. The company manufactures various types of pumps and does jobbing work in brass, aluminum and iron. **C. C. Rumble** is the proprietor.

Neonlight Laboratories, Inc., Los Angeles, Cal., **E. L. Murray**, head, is planning construction of a branch plant at El Paso, Tex., to manufacture electric signs and displays. Plant will cost about \$80,000 with equipment.

Kohver Pattern Company, 1656 Second Street, Milwaukee, Wis., manufacturer of wood and metal patterns, has broken ground for a one-story addition, 50 x 104 ft. New machinery for metal department will be purchased.

Markey Bronze Bushing Company, Delta, Ohio, is completing an addition giving it 2,590 square feet additional floor space, largely for offices, tool room, etc. This will release present floor space for additional foundry and machine equipment.

Manitowoc Plating Works, Manitowoc, Wis., recently acquired and now being operated by the **Aluminum Goods Manufacturing Company**, Manitowoc, is being enlarged by a five-story manufacturing and storage addition, 150 x 200 ft.

Aladdin Manufacturing Company, Muncie, Ind., manufacturer of metal goods, lamps, etc., has awarded general contract for a one-story unit at Alexandria, 90 x 130 ft., to cost about \$45,000 with equipment. **S. D. Goodwin** is plant superintendent.

General Electric Company, Schenectady, N. Y., will move manufacturing operations of its Baltimore plant to Philadelphia, but leaving the brass foundry in operation at Baltimore. The rest of the plant will be available for use whenever necessary.

Leeds and Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., manufacturer of electrical measuring instruments, has taken title to a factory on adjoining site heretofore held by **Atwater Kent Manufacturing Company** and will use it for expansion.

Armstrong Electric and Manufacturing Company, Huntington, W. Va., manufacturer of hardware and electrical products, is arranging for expansion to include manufacture of new household electrical specialties. **Col. R. Potter Campbell** is chairman of the Board.

Adolph Marchand, 680 Fifth Avenue, New York, manufacturer of lighting fixtures, has leased space in the building at 208 Rawson Street, Long Island City, for a new plant. The company will operate a brass machine shop, soldering and brazing rooms, and a plating, polishing, grinding and lacquering department. It is now in the market for equipment.

Multi-cell Radiator Corporation, 80 Terrace Street, Buffalo, N. Y., manufacturer of copper radiators, heat-

ing systems, etc., has purchased property at Lockport, N. Y., for a new plant, to cost more than \$60,000 with equipment. **Arthur B. and Charles A. Harrison** are the heads.

Aluminum Goods Manufacturing Company has leased a factory at St. Louis to **Wright Aeronautical Corporation**, Paterson, N. J., for assembling plant for Gypsy aircraft engines for light planes. Facilities will be provided for 200 engine units per month, to cost about \$150,000.

Robert Haley, for some years a partner in the **Master Carburetor Company**, Los Angeles, Cal., has leased the foundry formerly operated by the **Earle Hardware Manufacturing Company** at 2369 East Fifty-first Street, Los Angeles, where he will operate the **Haley Brass Foundry**.

The United States agency of **The British Aluminum Company, Ltd.**, in charge of **Arthur Seligman**, has removed its offices to the Chanin Building, 122 East 42nd Street, New York City, Suite 1907, it is announced. The company's new telephone numbers are Caledonia 1735-6-7-8.

Universal Stamping and Manufacturing Company, 2839 North Western Avenue, Chicago, Ill., awarded contract for a two-story, 107 x 174 ft. factory for the manufacture of metal specialties, screw machine products, gear cutting and plating and polishing equipment. Estimated cost is \$50,000.

Bertram-Bredy Company, 549 West Washington Boulevard, Chicago, Ill., has been appointed Western representative for **Eureka Metal Products Company**, Northeast, Pa., manufacturer of commutators, commutator bars, screw machine parts, drop forgings, and brass, copper, steel and alloy castings.

Beebe Boat Works, Inc., Port Huron, Mich., recently formed by **Jack Beebe**, Port Huron, and associates, has leased former local plant of the **Walker Electrical Refrigeration Company**, now the property of the **Bohn Aluminum and Brass Corporation**, Detroit, for a new plant to manufacture motor boats and other craft.

Cohn and Rosenberger, Inc., manufacturers of jewelry novelties, 10 Abbott Park Place, Providence, R. I., is erecting a building at Point, Hospital and South Streets. It is of reinforced concrete, three stories in height, with two wings, each 225 x 60 ft., joined by a building 60 x 60 ft., making a typical "H". The total floor area with basement will approximate 110,000 sq. ft.

The Advance Wheel Manufacturing Company, Inc., Chicago, Ill., has appointed **Mr. Scheffer** its representative in the Michigan territory. Mr. Scheffer will make his headquarters at 115 Mayfield Avenue, N. E., Grand Rapids. He has a wide range of knowledge of

the uses of polishing wheels for all metals and will provide the company's services and products for which there has been an increasing demand, it is stated.

The Decatur Brass and Aluminum Foundry Company has removed to the plant of the former **Halladay Company**, Decatur, Ill., where they will install a new half-ton electric furnace and other equipment incident to their entry into the iron and semi-steel castings fields. The company is embarking upon an expansion program and will enter new fields in the manufacture of bronze, brass and aluminum patterns, plates and castings.

Unedaburner Company, care of **F. H. Brinkerhoff**, 2 Main Street, Belleville, N. J., recently organized by Mr. Brinkerhoff and associates, has acquired the former local plant of **Eck Dynamo Company**, foot of Mill Street, consisting of two and three-story factory, 320 x 395 ft., and will occupy in part for manufacture of line of patented oil burners, valves and kindred specialties. **W. F. Bolte**, East Orange, N. J., is also interested in the new company.

Cadillac Motor Car Company, Detroit, Mich., has awarded general contract for the construction of a one and four-story building. The Cadillac company plans to spend \$5,000,000 during the next two years on an extensive building and new equipment program. The program includes an automatic screw machine building, an engineering building, a \$340,000 addition to its present foundry, an addition to the chrome, copper and nickel plating divisions, and an addition to the LaSalle assembly plant, etc.

National Harris Wire Company, Verona and Mt. Prospect Avenues, Newark, N. J., manufacturer of wire products, nickel tubing, etc., occupying part of the plant of the **Heller Brothers File Works**, has taken over remainder of the buildings for increased output. The company has purchased **Connecticut Wire Company**, Waterbury, and will consolidate with organization. The Waterbury plant will be removed to Newark works, where production will be concentrated. **Francis R. Harris** is president.

Victor Aluminum Manufacturing Company, Wells-ville, N. Y., has started production in the newly added plating department. Gold, silver, copper, nickel and chromium electro-plating is done with the equipment just installed. A building in the rear of the main plant houses the new department, and here a spraying plant has also been installed for lacquer work. New copper annealing ovens have been completed, which can accommodate from 500 to 1000 shells at a time. Polishing of the products turned out in this department will be done in the regular buffing department.

New Companies

William S. Rich and Son, Newark, N. J., has been incorporated to manufacture jewelry; \$300,000 pf., 5,000 shs. com.

Reliance Ideal Brass Foundry, D. R. Bernstein, 233 Broadway, New York, has been incorporated; \$25,000 pf., 500 shs. com.

Youngstown Metal and Supply Company, Youngstown, Ohio, has been incorporated by **S. Zoss**, **H. Goldberg** and **J. Levy**; \$2,000.

Modern Jewelry Manufacturing Company, care of

L. Mehl, 1778 Pitkin Avenue, Brooklyn, N. Y., has been incorporated with capital stock of \$10,000.

Wood-Keetch Metal Manufacturing Company, Fort Worth, Texas, has been incorporated with capital stock of \$12,500. Incorporators: **E. O. Wood**, **L. L. Wood**, **Charles A. Keetch**.

Alfred W. Grabo Company, 609 W. Lake Street, Chicago, Ill., has been incorporated with \$4,000 capital by **Leo Lichtenstein**, to engage in engineering and designing business, tool making, brass founder, etc.

Newark Metal Screen Company, 161 Ogden Street, Newark, N. J., has been incorporated with capital stock of \$200,000. The company manufactures a patented window screen. **Charles O. Frye** is treasurer and general manager.

John Alden, 463 West Gray Street, Elmira, N. Y., and **Francis Davidson**, 249 Erie Boulevard, Syracuse, N. Y., have organized **Alden and Davidson, Inc.**, and plan operation of a plant at Elmira to manufacture fire extinguishers and kindred equipment.

Ainsworth Manufacturing Corporation, Detroit,

Mich., has been incorporated with capital stock of \$2,000,000 and has taken over the **Ainsworth Manufacturing Company**, manufacturer of automobile windshields, stampings, rolled shapes and machine parts.

Ellwood Ivins Steel Tube Works, Inc., has been formed with capital of \$300,000 by Ellwood Ivins and associates to take over and expand **Ellwood Ivins Tube Works**, with plant at Oak Lane, Montgomery County, near Philadelphia. The new company will specialize in steel, aluminum, brass, bronze, copper and other metal tubing. **John B. Cording** is treasurer.

Trade Publications

Ferro Pickel Pills. The Weaver Brothers Company, Clinton, Mich. Circular on pills for testing pickling solutions.

When Committees Decide. Ferro Enamel Supply Company, Cleveland, Ohio. Interior views of porcelain enameling installations.

I-Witnesses. Semet-Solvay Company, 61 Broadway, New York City. Leaflet on paint for prevention of rust and corrosion of steel.

General Electric Company, Schenectady, N. Y. New publications: Novalux Floodlight Projectors; Direct Heat Electric Furnaces.

Built to Meet Your Requirements. Chicago Flexible Shaft Company, Chicago, Ill. Broadside on Stewart furnaces and heat treating equipment.

Mitchell Polishing, Buffing and Grinding Machinery. The Mitchell Engineering Company, Springfield, Ohio. Catalog, 31 pages, bound in paper and well illustrated.

Guaranteed Electric Motors. The Fuerst-Friedman Company, Cleveland, Ohio. Motors, motor-generators, compressors and other electrical equipment; catalog.

A New Era in Air Pumps. Leiman Brothers, Inc., 23 Walker Street, New York City. Air pressure blowers, gas and vacuum pumps and other equipment described in an illustrated booklet.

Divine Canvas Cushion Caster and Truck Wheels. Divine Brothers Company, Inc., Utica, N. Y. A complete, illustrated catalog, No. 22, of wheels and casters for varied industrial and other purposes.

The Monotron Hardness Indicator and Its Work. The Shore Instrument and Manufacturing Company, Jamaica, Long Island, N. Y. An interesting paper on the constant-diameter hardness indicator.

The Ferro Check Book. Ferro Enameling Company, Cleveland, Ohio. Control methods and laboratory practices used in manufacture of porcelain enamel frit. Book is 44 pages, bound and illustrated. Free on request to the company.

Magnetic Separation Equipment. Magnetic Manufacturing Company, Milwaukee, Wis. Bulletin 80, on equipment for concentration of ores and minerals, together with theoretical and practical data gained during thirty years of study in this field.

General Electric Company, Schenectady, N. Y., publications: G-E Industrial Heating Devices; Centrifugal Compressors, Geared Units; Enclosed, Fan-Cooled D-C Motors; Magnetic Switch for Induction Motors; Electric Furnaces for Vitreous Enameling.

DeVilbiss Portable Spray-Painting Equipment. The DeVilbiss Company, Toledo, Ohio. An inter-

esting illustrated catalog, combining excellent engineering and educational data on various spray painting devices as well as cataloging some the company's products in this line.

Foundry Molding Machines. The Tabor Manufacturing Company, Philadelphia, Pa. Handsome loose-leaf folder containing a variety of interesting data on molding machinery; fully illustrated; a very fine example of the combination of engineering data and commercial cataloging. Of interest to every foundryman.

Data on Industrial Heating Processes. Compiled by the Engineering Department of the Surface Combustion Company, Toledo, Ohio. The engineering staff of the Surface Combustion Company has made this collection of the data sheets and catalog descriptions of all of their equipment. It is a fine collection, with a large volume of engineering data.

Budget Control: What It is and How To Do It. Published by Ernst and Ernst, 80 Maiden Lane, New York. Size 6 x 9, 40 pages. How each part of the business budget should be prepared and the principles of its effective operation together with a summary of benefits, are set forth in this revised edition of a book published originally four years ago. The book lists sixteen ways in which properly planned and directed budget benefits business. It is a concise and useful review.

Laboratory Apparatus and Reagents. Published by the Fisher Scientific Company, Pittsburgh, Pa. Size 7½ x 10½, 630 pages. This is in one sense a catalog and price-list, but in another sense, considerably more. It is compiled differently from most catalogs, being a collection of "preferred apparatus," recommended to meet the needs of modern laboratories. More than passing mention is made of the standardization work of several technical societies, such as the American Chemical Society and the American Society for Testing Materials.

Mechanical World Year Book—1929. Emmott and Company, Ltd., 65 King Street, Manchester, Eng. A handy compendium of mechanical engineering data, suitable chiefly for British use, since many of the fields covered are peculiar to Great Britain and its possessions, and much of the material is presented in terms not used in the United States. It is a very authoritative work which is revised yearly. The price is 1s. 6d., net. Similarly, the **Mechanical World Electrical Pocket Book—1929** gives a large amount of electrical engineering data in equally authoritative fashion, but on which the same comment is necessary as to its greater use to British than to American engineers. This is also published at 1s. 6d. net.

Metal Prices, May 20, 1929

NEW METALS

Copper: Lake, 18.125. Electrolytic, 18.00. Casting, 17.25.
Zinc: Prime Western, 6.55. Brass Special, 6.70.
Tin: Straits, 44.00. Pig, 99%, 43.25.
Lead: 6.80. Aluminum, 24.30. Antimony, 8.875.

Nickel: Ingot, 35. Shot, 36. Elec. 35. Pellets, 40.
Quicksilver: flask, 75 lbs., \$123. Bismuth, \$1.70.
Cadmium, 95. Cobalt, 97%, \$2.60. Silver, oz., Troy, 53.75.
Gold: oz., Troy, \$20.67. Platinum, oz., Troy, \$65.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	13½
Brass Ingots, Red	16
Bronze Ingots	17½
Casting Aluminum Alloys.....	21 to 24
Manganese Bronze Castings	28 to 40
Manganese Bronze Ingots	16 to 21
Manganese Bronze Forgings	36 to 44
Manganese Copper, 30%	30 to 40
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots.....	16½ to 19¾
Phosphor Bronze	19 to 22
Phosphor Copper, guaranteed 15%	22½ to 25
Phosphor Copper, guaranteed 10%	21½ to 24
Phosphor Tin, no guarantee	55 to 70
Silicon Copper, 10%.....according to quantity.....	30 to 35

OLD METALS

Buying Prices	Selling Prices
16½ to 16¾ Heavy Cut Copper	17½ to 17¾
14½ to 14¾ Copper Wire, mixed	15½ to 15¾
11¾ to 12 Light Copper	12¾ to 13
13 to 13¾ Heavy Machine Composition.....	14 to 14¾
9 to 9½ Heavy Brass	10 to 10½
7 to 7½ Light Brass	8 to 8½
9¾ to 10¼ No. 1 Yellow Brass Turnings.....	10¾ to 11¼
12¼ to 12½ No. 1 Composition Turnings	13¼ to 13½
5¼ to 5½ Heavy Lead	6 to 6½
3½ to 3¾ Zinc Scrap	4¾ to 5¼
8 to 10 Scrap Aluminum Turnings	12½ to 14¾
13 to 13½ Scrap Aluminum, cast alloyed	17½ to 18½
19 to 20 Scrap Aluminum sheet (new)	22 to 22½
30½ to 32 No. 1 Pewter	35 to 38
20 to 21 Old Nickel Anodes	22 to 23
20 to 23 Old Nickel	22 to 25

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled) 27¾ to 28¾c. net base
From Stock 28¾ to 29¾c. net base

BARE COPPER WIRE

19½c. to 19¾c. net base, in carload lots.

COPPER SEAMLESS TUBING

29¼c. to 30¼c. net base.

SOLDERING COPPERS

300 lbs. and over in one order 26¼c. net base
100 lbs. to 200 lbs. in one order 26¾c. net base

ZINC SHEET

Duty sheet, 2c. per lb. Cents per lb.
Carload lots, standard sizes and gauges, at mill,
less 7 per cent discount 10.25 net base
Casks, jobbers' price 10.50 net base
Open casks, jobbers' price 11.00-11.50 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base, ton lots, per lb. 33.30
Aluminum coils, 24 ga., base, price 31.00

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods..... 53c. Cold Rolled Sheet..... 60c.
Hot Rolled Rods..... 45c. Full Finished Sheet..... 52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 56c. to 58c. per ounce, Troy.

BRASS MATERIAL—MILL SHIPMENTS

In effect April 16, 1929.

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	\$0.23¼	\$0.25	\$0.26¼
Wire	.23¼	.25½	.26¾
Rod	.21¼	.25¾	.27
Brazed tubing	.30¾		.35½
Open seam tubing	.31¼		.34¾
Angles and channels	.31¼		.34¾

BRASS SEAMLESS TUBING

28¾c. to 29¼c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod 25¾c. net base
Muntz or Yellow Metal Sheathing (14"x48")... 24c. net base
Muntz or Yellow Rectangular sheet other
Sheathing 25c. net base
Muntz or Yellow Metal Rod 22¼c. net base
Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal	Wire and Rod
10% Quality..... 31¾c.	10% Quality..... 34¼c.
15% Quality..... 33c.	15% Quality..... 37¼c.
18% Quality..... 34¾c.	18% Quality..... 41c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base). 35 Full Finished Sheets (base) 42
Cold Drawn Rods (base) 40 Cold Rolled Sheets (base).. 50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin. price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, May 20, 1929

ANODES

Copper: Cast	28c. per lb.	Nickel: 90-92%	45c. per lb.
Rolled, oval	27c. per lb.	95-97%	47c. per lb.
Rolled, sheets, trimmed	27¾c. per lb.	99%	49c. per lb.
Brass: Cast	27c. per lb.	Silver: Rolled silver anodes .999 fine are quoted from 57¾ to 59¾c., Troy ounce, depending upon quantity.	
Zinc: Cast	12½c. per lb.		

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	\$3.00/lb.	\$2.75/lb.	\$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	\$28.10 to 30.49
14" 20 ply 64/68 Unbleached	37.15 to 40.44
12" 20 ply 80/92 Unbleached	31.50 to 24.16
14" 20 ply 80/92 Unbleached	42.85 to 46.09
12" 20 ply 84/92 Unbleached	40.80 to 42.90
14" 20 ply 84/92 Unbleached	54.60 to 57.60
12" 20 ply 80/84 Unbleached	37.40 to 39.37
14" 20 ply 80/84 Unbleached	50.45 to 53.12
Sewed Pieced Buffs, per lb., bleached	40c to 73c

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	14-19	Iron Sulphate (Copperas), bbl.	lb.	.01½
Acid—Boric (Boracic) Crystals	lb.	.08½	Lead Acetate (Sugar of Lead)	lb.	.13¼
Chromic 100 and 400 lb. drums	lb.	.20½-.21	Yellow Oxide (Litharge)	lb.	.12½
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02	Mercury Bichloride (Corrosive Sublimate)	lb.	\$1.58
Hydrochloric, C. P., 20 deg., carboys	lb.	.06	Nickel—Carbonate, dry, bbls.	lb.	.35
Hydrofluoric, 30% bbls.	lb.	.08	Chloride, bbls.	lb.	.20
Nitric, 36 deg., carboys	lb.	.06	Salts, single, 300 lb. bbls.	lb.	.13
Nitric, 42 deg., carboys	lb.	.07	Salts, double, 425 lb. bbls.	lb.	.13
Sulphuric, 66 deg., carboys	lb.	.02	Paraffin	lb.	.05-.06
Alcohol—Butyl	lb.	.16¾-.21¼	Phosphorus—Duty free, according to quantity ..	lb.	.35-.40
Denatured, drums	gal.	.45-.57	Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09
Alum—Lump, Barrels	lb.	.03¾	Potassium Bichromate, casks (crystals)	lb.	.09¼
Powdered, Barrels	lb.	.039	Carbonate, 96-98%	lb.	.06¾-.07
Aluminum sulphate, commercial tech.	lb.	3.3	Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Aluminum chloride solution in carboys	lb.	.06½	Pumice, ground, bbls.	lb.	.02½
Ammonium—Sulphate, tech., bbls.	lb.	3.3	Quartz, powdered	ton	\$30.00
Sulphocyanide	lb.	.65	Rosin, bbls.	lb.	.04½
Arsenic, white, kegs	lb.	.05	Rouge, nickel, 100 lb. lots	lb.	.25
Asphaltum	lb.	.35	Silver and Gold	lb.	.65
Benzol, pure	gal.	.60	Sal Ammoniac (Ammonium Chloride) in casks ..	lb.	.05½
Borax Crystals (Sodium Biborate), bbls.	lb.	.04½	Silver Chloride, dry, 100 oz. lots	oz.	.45
Calcium Carbonate (Precipitated Chalk)	lb.	.04	Cyanide (fluctuating)	oz.	.55-.57½
Carbon Bisulphide, Drums	lb.	.06	Nitrate, 100 ounce lots	oz.	.39
Chrome Green, bbls.	lb.	.25	Soda Ash, 58%, bbls.	lb.	.02½
Chromic Sulphate	lb.	.30	Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.18
Copper—Acetate (Verdigris)	lb.	.23	Hyposulphite, kegs	lb.	.04
Carbonate, bbls.	lb.	.21½	Nitrate, tech., bbls.	lb.	.04¾
Cyanide (100 lb. kegs)	lb.	.50	Phosphate, tech., bbls.	lb.	.03¾
Sulphate, bbls.	lb.	6.7	Silicate (Water Glass), bbls.	lb.	.02
Cream of Tartar Crystals (Potassium Bitartrate) ..	lb.	.27	Sulpho Cyanide	lb.	.32½
Crocus	lb.	.15	Sulphur (Brimstone), bbls.	lb.	.02
Dextrin	lb.	.05-.08	Tin Chloride, 100 lb. kegs	lb.	.35
Emery Flour	lb.	.06	Tripoli, Powdered	lb.	.03
Flint, powdered	ton	\$30.00	Wax—Bees, white, ref. bleached	lb.	.60
Fluor-spar (Calcic fluoride)	ton	\$70.00	Yellow, No. 1	lb.	.45
Fusel Oil	gal.	\$4.45	Whiting, Bolted	lb.	.02½-.06
Gold Chloride	oz.	\$14.00	Zinc Carbonate, bbls.	lb.	.11
Gum—Sandarac	lb.	.26	Chloride, casks	lb.	.06¾
Shellac	lb.	.59-.61	Cyanide (100 lb. kegs)	lb.	.41
			Sulphate, bbls.	lb.	.03¾